Nelson Mathematics 3

Teacher's Resource

Ontario Supplement

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Introduction

This supplement is designed to align Nelson Mathematics to the 2005 Ontario Curriculum.
Nelson Mathematics is built on a sound research foundation (see *Mathematics Education: A Summary of Research, Theories, and Practice* available at any Teacher Centre on the Nelson Mathematics Web site). The instructional design, including the integration of assessment and evaluation, is congruent with current best practice.

Organization of the Ontario Supplement for *Nelson Mathematics 3*

The Chapter Planning Charts in this supplement provide
- expectations addressed in each lesson and Chapter Task
- teaching suggestions for adapting existing lessons
- identification of lessons that are not required for the grade expectations
- identification of lessons that are beyond the grade expectations
- references to new lessons

Following the Planning Charts are the new student lessons to address new expectations, each followed by the related teaching notes.

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Note: Parts of expectations that are inside square brackets are addressed in other lessons.

Chapter 1 Planning Chart: Patterns in Mathematics

Content	Expectations	Addressing Expectations
Getting Started: Patterns All Around, pp. 2–3		Assessment Opportunity
Lesson A: Action Patterns, Supplement, p. 28	• describe, [extend,] and create a variety of [numeric patterns and geometric] patterns – identify, [extend,] and create a repeating pattern involving two attributes, using a variety of tools – demonstrate, through investigation, an understanding that a pattern results from repeating an action, [repeating an operation, using a transformation,] or making some other repeated change to an attribute	New lesson
Lesson 1: Repeating Shape Patterns, pp. 4–5	• describe, extend, and create a variety of [numeric patterns and] geometric patterns – identify, extend, and create a repeating pattern involving two attributes, using a variety of tools – extend repeating, [growing, and shrinking] number patterns – demonstrate, through investigation, an understanding that a pattern results from [repeating an action, repeating an operation,] using a transformation, or making some other repeated change to an attribute	
Lesson 2: Exploring Patterns, p. 6	• describe, extend, and create a variety of [numeric patterns and geometric] patterns – identify, extend, and create a repeating pattern involving two attributes, using a variety of tools – demonstrate, through investigation, an understanding that a pattern results from [repeating an action, repeating an operation, using a transformation, or] making some other repeated change to an attribute	
Mental Math: Addition Patterns, p. 7		Optional
Curious Math: Dance Patterns, p. 7		Optional
Lesson 3: Patterns in a 100 Chart, pp. 8–9	• describe, extend, and create a variety of numeric patterns [and geometric patterns] • demonstrate an understanding of magnitude by counting forward and backwards by various numbers and from various starting points – identify and describe, through investigation, number patterns involving addition, subtraction, [and multiplication,] represented [on a number line,] on a calendar, and on a hundreds chart – extend [repeating,] growing, and shrinking number patterns – create a number pattern involving addition or subtraction, given [a pattern represented on a number line or] a pattern rule expressed in words – count forward by 1s, 2s, 5s, [10s, and 100s to 1000 from various starting points, and by 25s to 1000 starting from multiples of 25,] using a variety of tools and strategies – count backwards by 2s, [5s,] and 10s from 100 using multiples of 2, [5], and] 10 as starting points, [and count backwards by 100s from 1000 and any number less than 1000,] using a variety of tools and strategies	The focus in this chapter is addition and subtraction. Multiplication patterns are explored in Chapter 9. ***Teaching and Learning:*** Extend this lesson by having students explore patterns on a calendar. They can start on 1 and add 2, 3, 4, 5, 6, or 7 each time, marking the dates in the pattern over the course of a month, and then describe the patterns in the calendar.
Mid-Chapter Review: p. 10		Assessment Opportunity
Math Game: Changing Attributes, p. 11		Optional
Lesson 4: Patterns in T-Charts, pp. 12–13	• describe, extend, [and create] a variety of numeric patterns and geometric patterns – identify and describe, through investigation, number patterns involving addition, [subtraction, and multiplication,] represented on a number line, [on a calendar, and on a hundreds chart] – extend [repeating,] growing, [and shrinking] number patterns – represent simple geometric patterns using a number sequence, a number line, [or a bar graph]	***Teaching and Learning:*** Extend this lesson by having students use a number line to represent and extend growing patterns.
Lesson 5: Communicate About Patterns, pp. 14–15	• describe, extend, and create a variety of numeric patterns and geometric patterns – identify, extend, and create a repeating pattern involving two attributes, using a variety of tools	

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Content	Expectations	Addressing Expectations
Lesson 6: Modelling Patterns, pp. 16–17	• describe, extend, [and create] a variety of numeric patterns and geometric patterns – extend repeating, [growing, and shrinking number] patterns	
Skills Bank: pp. 18–19		For Question 8, have students identify the rule for each pattern (i.e., Start at 3 and add 5, add 2, repeat, and start at 7 and add 7 each time) and make connections between these and the patterns on the calendar.
Problem Bank: p. 20		
Chapter Review: p. 21		Assessment Opportunity For Question 5 (optional), have students identify the pattern rules and make connections between these and the patterns on the calendar.
Chapter Task: Shape Patterns and Number Patterns, p. 22	• describe, extend, and create a variety of numeric patterns and geometric patterns – extend [repeating,] growing, [and shrinking] number patterns – represent simple geometric patterns using a number sequence, [a number line, or a bar graph] – demonstrate, through investigation, an understanding that a pattern results from [repeating an action,] repeating an operation, [using a transformation,] or making some other repeated change to an attribute	Assessment Opportunity

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Chapter 2 Planning Chart: Numeration

Content	Expectations	Addressing Expectations
Getting Started: Numbers, pp. 24–25		Assessment Opportunity
Lesson 1: Representing Numbers, pp. 26–27	• read, represent, [compare, and order] whole numbers to 1000, [and use concrete materials to represent fractions and money amounts to $10] • demonstrate an understanding of magnitude by counting forward [and backwards] by various numbers and from various starting points – represent, [compare, and order] whole numbers to 1000, using a variety of tools – read and print in words whole numbers to one hundred, using meaningful contexts – identify and represent the value of a digit in a number according to its position in the number – compose and decompose [three-digit] numbers into [hundreds,] tens, and ones in a variety of ways, using concrete materials – count forward by 1s, [2s, 5s,] 10s, [and 100s to 1000] from various starting points, [and by 25s to 1000 starting from multiples of 25,] using a variety of tools and strategies	Expanded form is not mentioned in the Grade 3 curriculum but is included as an important part of the development of number concepts in this lesson.
Lesson 2: Renaming Numbers, pp. 28–29	• read, represent, [compare, and order] whole numbers to 1000, [and use concrete materials to represent fractions and money amounts to $10] – represent, [compare, and order] whole numbers to 1000, using a variety of tools – identify and represent the value of a digit in a number according to its position in the number – compose and decompose three-digit numbers into hundreds, tens, and ones in a variety of ways, using concrete materials	
Lesson 3: Place-Value Patterns, pp. 30–31	• demonstrate an understanding of magnitude by counting forward and backwards by various numbers and from various starting points – count forward by [1s, 2s, 5s,] 10s, and 100s to 1000 from various starting points, [and by 25s to 1000 starting from multiples of 25,] using a variety of tools and strategies – count backwards by [2s, 5s, and] 10s from 100 using multiples of [2, 5, and] 10 as starting points, and count backwards by 100s from 1000 and any number less than 1000, using a variety of tools and strategies – create a number pattern involving addition or subtraction, given [a pattern represented on a number line or] a pattern rule expressed in words – demonstrate, through investigation, an understanding that a pattern results from [repeating an action,] repeating an operation, [using a transformation, or making some other repeated change to an attribute]	***Teaching and Learning:*** In this lesson, students count backwards by 10s from numbers that are not multiples of 10, which is beyond the Grade 3 curriculum. Introduce the lesson with counting backwards from multiples of 10 or adapt the lesson by replacing the number 231 with 230 in the activity.
Lesson A: Exploring 1000, Supplement, p. 30	– represent and explain, using concrete materials, the relationship among the numbers 1, 10, 100, and 1000	New Lesson
Mental Math: Adding Tens, p. 31		Optional
Lesson 4: Rounding to Estimate Numbers, pp. 32–33	• read, represent, compare, and order whole numbers to 1000, [and use concrete materials to represent fractions and money amounts to $10] – represent, compare, and order whole numbers to 1000, using a variety of tools – round two-digit numbers to the nearest ten, in problems arising from real-life situations	***Teaching and Learning:*** In this lesson, students round three-digit numbers to the nearest hundred and ten, which is beyond the Grade 3 curriculum. Introduce the lesson with rounding two-digit numbers to the nearest ten. You may also want to simplify the lesson by replacing three-digit numbers with two-digit numbers and using number lines divided into tens.
Lesson 5: Comparing and Ordering, pp. 34–35	• read, represent, compare, and order whole numbers to 1000, [and use concrete materials to represent fractions and money amounts to $10] – represent, compare, and order whole numbers to 1000, using a variety of tools – identify and represent the value of a digit in a number according to its position in the number – solve problems that arise from real-life situations and that relate to the magnitude of whole numbers up to 1000	
Mid-Chapter Review: p. 36		Assessment Opportunity For Questions 6–8, replace the numbers with two-digit numbers.
Math Game: Duelling Digits, p. 37		Optional

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Content	Expectations	Addressing Expectations
Lesson 6: Solve Problems Using Organized Lists, pp. 38–39	• read, represent, compare, and order whole numbers to 1000, and use concrete materials to represent [fractions and] money amounts to $10 – represent, compare, and order whole numbers to 1000, using a variety of tools – identify and represent the value of a digit in a number according to its position in the number – solve problems [that arise from real-life situations and] that relate to the magnitude of whole numbers up to 1000	Omit Question 7 or use after money notation has been introduced.
Lesson 7: Ordinal Numbers, pp. 40–41	• read, represent, compare, and order whole numbers to 1000, [and use concrete materials to represent fractions and money amounts to $10] – represent, compare, and order whole numbers to 1000, using a variety of tools	***Teaching and Learning:*** Introduce the lesson with a review of ordinal numbers.
Lesson 8: Counting and Trading Coins, pp. 42–43	• [read, represent, compare, and order whole numbers to 1000, and] use concrete materials to represent [fractions and] money amounts to $10 – represent and describe the relationships between coins and bills up to $10 – [estimate,] count, and represent (using the $ symbol) the value of a collection of coins and bills with a maximum value of $10	***Teaching and Learning:*** Introduce the lesson with a review of standard money notation related to a group of play coins or a sketch (e.g., 1 dollar and 25 cents is written $1.25; 250 cents is written $2.50; the dot separating the dollars and cents is called the *decimal* point).
Math Game: Race for 2 Toonies, p. 43		Optional
Lesson B: Counting Patterns, Supplement, pp. 32–33	• demonstrate an understanding of magnitude by counting forward and backwards by various numbers and from various starting points – count forward by [1s, 2s,] 5s, [10s,] and 100s to 1000 from various starting points, and by 25s to 1000 starting from multiples of 25, using a variety of tools and strategies – count backwards by 2s, 5s[, and 10s] from 100 using multiples of 2, 5, and 10 as starting points, and count backwards by 100s from 1000 and any number less than 1000, using a variety of tools and strategies.	New Lesson
Lesson 9: Trading Bills, p. 44		Beyond Grade 3 curriculum
Lesson C: Estimating and Counting Money, Supplement, pp. 35–36	• [read, represent, compare, and order whole numbers to 1000, and] use concrete materials to represent [fractions and] money amounts to $10 – represent and describe the relationships between coins and bills up to $10 – estimate, count, and represent (using the $ symbol) the value of a collection of coins and bills with a maximum value of $10	New Lesson
Skills Bank: pp. 45–46		For Question 6 a), use 570, 470, 370, …. For Question 8 b)–f), replace the numbers with two-digit numbers. Omit Question 14.
Problem Bank: p. 47		
Chapter Review: pp. 48–49		Assessment Opportunity For Question 5 a), use 670, 660, 650, …. Omit Question 8 d).
Chapter Review: Supplement, pp. 38–39		New Assessment Opportunity
Chapter Task: Palindromes, p. 50	• read, represent, compare, and order whole numbers to 1000, [and use concrete materials to represent fractions and money amounts to $10] – represent, compare, and order whole numbers to 1000, using a variety of tools – solve problems [that arise from real-life situations and] that relate to the magnitude of whole numbers up to 1000	Assessment Opportunity

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Chapter 3 Planning Chart: Data Management

<table>
<tr><th>Content</th><th>Expectations</th><th>Addressing Expectations</th></tr>
<tr><td>Getting Started: Sorting and Graphing, pp. 52–53</td><td></td><td>Assessment Opportunity</td></tr>
<tr><td>Lesson 1: Venn Diagrams, pp. 54–55</td><td>• [collect and] organize categorical or discrete primary data and display the data [using charts and graphs, including vertical and horizontal bar graphs, with labels ordered appropriately along horizontal axes, as needed]
– demonstrate an ability to organize objects into categories, by sorting and classifying objects using two or more attributes simultaneously</td><td>Teaching and Learning: Extend the lesson to include sorting and classifying objects using more than two attributes by having students sort the foods listed on Food Cutouts, TR p. 57, using a chart such as the following:
<table>
<tr><td>Food</td><td>Fruit</td><td>Green</td><td>Round</td></tr>
<tr><td>red apple</td><td>√</td><td></td><td>√</td></tr>
<tr><td>carrots</td><td></td><td></td><td></td></tr>
<tr><td>lettuce</td><td></td><td>√</td><td>√</td></tr>
</table></td></tr>
<tr><td>Lesson 2: Collecting and Organizing Data, pp. 56–57</td><td>• collect and organize categorical or discrete primary data and display the data using charts [and graphs, including vertical and horizontal bar graphs, with labels ordered appropriately along horizontal axes, as needed]
• read, describe, and interpret primary data presented in charts [and graphs, including vertical and horizontal bar graphs]
– collect data by conducting a simple survey about themselves, their environment, issues in their school or community, or content from another subject
– collect and organize categorical or discrete primary data and display the data in charts, [tables, and graphs (including vertical and horizontal bar graphs), with appropriate titles and labels and with labels ordered appropriately along horizontal axes, as needed, using many-to-one correspondence]
– interpret and draw conclusions from data presented in charts, tables, [and graphs]</td><td></td></tr>
<tr><td>Curious Math: It Takes All Sorts, p. 57</td><td></td><td>Optional</td></tr>
<tr><td>Lesson 3: Reading and Creating Pictographs, pp. 58–59</td><td>• collect and organize categorical or discrete [primary] data and display the data using charts and graphs, [including vertical and horizontal bar graphs, with labels ordered appropriately along horizontal axes, as needed]
– collect and organize categorical or discrete [primary] data and display the data in charts, tables, and graphs [(including vertical and horizontal bar graphs)], with appropriate titles and labels [and with labels ordered appropriately along horizontal axes, as needed,] using many-to-one correspondence
– read [primary] data presented in charts, tables, and graphs [(including vertical and horizontal bar graphs),] then describe the data using comparative language, and describe the shape of the data
– interpret and draw conclusions from data presented in [charts, tables, and] graphs</td><td>Teaching and Learning:
For Questions 5 & 6, ask students to describe the shape of each set of data.
Have students collect and organize their own data by surveying classmates on their favourite category of movies (adventure, comedy, cartoons, nature) and display the data in a pictograph with a scale greater than 1:1.</td></tr>
<tr><td>Mid-Chapter Review: p. 60</td><td></td><td>Assessment Opportunity</td></tr>
<tr><td>Mental Imagery: Paper Folds, p. 61</td><td></td><td>Optional</td></tr>
<tr><td>Lesson 4: Bar Graphs with Scales, pp. 62–63</td><td>• [collect and organize categorical or discrete primary data and] display [the] data using [charts and] graphs, including vertical and horizontal bar graphs, with labels ordered appropriately along horizontal axes, as needed
• read, describe, and interpret [primary] data presented in charts and graphs, including vertical and horizontal bar graphs
– [collect and organize categorical or discrete primary data and] display [the] data in [charts, tables, and] graphs (including vertical and horizontal bar graphs), with appropriate titles and labels and with labels ordered appropriately along horizontal axes, as needed, using many-to-one correspondence
– read [primary] data presented in charts, tables, and graphs (including vertical and horizontal bar graphs), then describe the data using comparative language, and describe the shape of the data</td><td>Teaching and Learning: As a class, redraw Amit's graph as a horizontal bar graph. Discuss what has changed (the orientation of the graph, the position of labels) and what has stayed the same (the title, labels, scale, and lengths of bars (i.e., the data)).
For Questions 5 & 6, ask students to describe the shape of each set of data.
Conduct a class survey on students' favourites of three zoo animals (e.g., tiger, elephant, polar bear) and record the data in a chart. Have students display the data in a horizontal bar graph with a scale greater than 1:1.</td></tr>
<tr><td>Lesson A: Patterns in Graphs, Supplement, p. 40</td><td>– represent simple geometric patterns using a number sequence, [a number line,] or a bar graph</td><td>New Lesson</td></tr>
</table>

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Content	Expectations	Addressing Expectations
Lesson B: Mode, Supplement, pp. 42–43	• read, describe, and interpret primary data presented in charts and graphs, including [vertical and] horizontal bar graphs – read primary data presented in charts, tables, and graphs (including [vertical and] horizontal bar graphs), then describe the data using comparative language, [and describe the shape of the data] – interpret and draw conclusions from data presented in charts, tables, and graphs – demonstrate an understanding of mode, and identify the mode in a set of data	New Lesson
Lesson 5: Communicate About Data, pp. 64–65	• read, describe, and interpret primary data presented in charts and graphs, including vertical [and horizontal] bar graphs – read primary data presented in charts, tables, and graphs (including vertical [and horizontal] bar graphs), then describe the data using comparative language, and describe the shape of the data – interpret and draw conclusions from data presented in charts, tables, and graphs	***Teaching and Learning:*** Ask students to explain why there is no mode for any of the sets of data displayed in this lesson (no data value occurs more than once).
Lesson 6: Circle Graphs, pp. 66–67		Beyond Grade 3 curriculum
Skills Bank: pp. 68–69		Use Questions 1–4.
Problem Bank: pp. 70–71		Use Questions 1–5.
Chapter Review: pp. 72–73		Assessment Opportunity Use Questions 1–6. To review Lesson B: **8.** Identify the mode for each set of data. **a)** 7, 8, 8, 9, 6, 7, 9, 7, 8, 6, 7 **b)** 20, 21, 19, 22, 21, 27, 18, 23 Answers: **a)** 7 **b)** 21
Chapter Task: Graphing Data About Names, p. 74	• collect and organize categorical or discrete primary data and display the data using charts and graphs, including vertical and horizontal bar graphs, with labels ordered appropriately along horizontal axes, as needed • read, describe, and interpret primary data presented in charts and graphs, including vertical and horizontal bar graphs – demonstrate an ability to organize objects into categories, by sorting and classifying objects using two or more attributes simultaneously – [collect and] organize categorical or discrete primary data and display the data in charts, tables, and graphs (including vertical and horizontal bar graphs), with appropriate titles and labels and with labels ordered appropriately along horizontal axes, as needed, using many-to-one correspondence – read primary data presented in charts, tables, and graphs (including vertical and horizontal bar graphs), then describe the data using comparative language, and describe the shape of the data – interpret and draw conclusions from data presented in charts, tables, and graphs	Assessment Opportunity
Chapters 1–3 Cumulative Review: pp. 75–76		Assessment Opportunity Use Questions 1–5, 7–9. Add Question **9 d)**: What is the mode of Gina's data? Answer: 4

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Chapter 4 Planning Chart: Addition and Subtraction

Content	Expectations	Addressing Expectations
Getting Started: Adding and Subtracting, pp. 78–79		Assessment Opportunity
Lesson 1: Relating Subtraction to Addition, pp. 80–81	• demonstrate an understanding of equality between pairs of expressions, using addition [and subtraction] of one- [and two-]digit numbers • solve problems involving the addition and subtraction of single- and multi-digit whole numbers, using a variety of strategies, [and demonstrate an understanding of multiplication and division] – determine, through investigation, the inverse relationship between addition and subtraction – determine the missing number in equations involving addition and subtraction of one- and two-digit numbers, using a variety of tools and strategies – solve problems involving the addition and subtraction of two-digit numbers, using a variety of [mental] strategies	
Lesson 2: Adding and Subtracting Tens, pp. 82–83	• solve problems involving the addition and subtraction of [single- and] multi-digit whole numbers, using a variety of strategies, [and demonstrate an understanding of multiplication and division] – identify and represent the value of a digit in a number according to its position in the number – solve problems involving the addition and subtraction of two-digit numbers, using a variety of mental strategies	
Lesson 3: Mental Addition and Subtraction, pp. 84–85	• solve problems involving the addition and subtraction of single- and multi-digit whole numbers, using a variety of strategies, [and demonstrate an understanding of multiplication and division] – solve problems involving the addition and subtraction of two-digit numbers, using a variety of mental strategies	
Mid-Chapter Review: p. 86		Assessment Opportunity
Math Game: Operation 25, p. 87		Optional
Lesson 4: Solve Problems by Acting Them Out, pp. 88–89	• solve problems involving the addition and subtraction of single- and multi-digit whole numbers, using a variety of strategies, [and demonstrate an understanding of multiplication and division] • [describe,] extend, [and create] a variety of numeric patterns [and geometric patterns] – solve problems involving the addition and subtraction of two-digit numbers, using a variety of [mental] strategies – identify and describe, through investigation, number patterns involving addition, subtraction, [and multiplication,] represented on a number line, [on a calendar, and on a hundreds chart]	
Lesson 5: Estimating Sums and Differences, pp. 90–91	• solve problems involving the addition and subtraction of single- and multi-digit whole numbers, using a variety of strategies, [and demonstrate an understanding of multiplication and division] – round two-digit numbers to the nearest ten, in problems arising from real-life situations – use estimation when solving problems involving addition and subtraction, [to help judge the reasonableness of a solution]	
Lesson A: Exploring Mental Math Strategies, Supplement, p. 45	• solve problems involving the addition and subtraction of single- and multi-digit whole numbers, using a variety of strategies, [and demonstrate an understanding of multiplication and division] • demonstrate an understanding of equality between pairs of expressions, using addition and subtraction of one- and two-digit numbers – solve problems involving the addition and subtraction of two-digit numbers, using a variety of mental strategies – identify, through investigation, and use the associative property of addition to facilitate computation with whole numbers	New Lesson
Lesson 6: Adding 2-Digit Numbers, pp. 92–93	• solve problems involving the addition [and subtraction] of [single- and] multi-digit whole numbers, using a variety of strategies, [and demonstrate an understanding of multiplication and division] – solve problems involving the addition [and subtraction] of two-digit numbers, using a variety of [mental] strategies	

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Content	Expectations	Addressing Expectations
	– use estimation when solving problems involving addition [and subtraction,] to help judge the reasonableness of a solution – add and subtract money amounts, using a variety of tools, to make simulated purchases [and change for amounts up to $10]	
Lesson 7: Subtracting 2-Digit Numbers, pp. 94–95	• solve problems involving the [addition and] subtraction of [single- and] multi-digit whole numbers, using a variety of strategies, [and demonstrate an understanding of multiplication and division] – solve problems involving the [addition and] subtraction of two-digit numbers, using a variety of [mental] strategies – use estimation when solving problems involving [addition and] subtraction, to help judge the reasonableness of a solution	
Lesson B: Finding Missing Numbers, Supplement, pp. 47–48	• solve problems involving the addition and subtraction of single- and multi-digit whole numbers, using a variety of strategies, [and demonstrate an understanding of multiplication and division] – determine, the missing number in equations involving addition and subtraction of one- and two-digit numbers, using a variety of tools and strategies – solve problems involving the addition and subtraction of two-digit numbers, using a variety of [mental] strategies	New Lesson
Mental Math: Finding 10s, p. 96		
Skills Bank: pp. 97–99		
Problem Bank: p. 100		
Chapter Review: p. 101		Assessment Opportunity To review Lessons A and B: **10.** Use mental math to calculate. **a)** 55 − 19 **b)** 22 + 39 **c)** 68 + 16 **d)** 37 + 44 **11.** Complete each number sentence. **a)** 25 + ■ = 35 **b)** 16 + ■ = 28 **c)** 29 − ■ = 15 **d)** ■ − 12 = 20 Answers: **10. a)** 36 **b)** 61 **c)** 84 **d)** 81 **11. a)** 25 + 10 = 35 **b)** 16 + 12 = 28 **c)** 29 − 14 = 15 **d)** 32 − 12 = 20
Chapter Task: Swimming Schedules, p. 102	• solve problems involving the addition and subtraction of single- and multi-digit whole numbers, using a variety of strategies, [and demonstrate an understanding of multiplication and division] – solve problems involving the addition and subtraction of two-digit numbers, using a variety of [mental] strategies	Assessment Opportunity

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Chapter 5 Planning Chart: Measuring Length, Time, and Temperature

Content	Expectations	Addressing Expectations
Getting Started: Measuring Optical Illusions, pp. 104–105		Assessment Opportunity
Lesson 1: Measuring in Centimetres, pp. 106–107	• estimate, measure, and record length, [perimeter, area, mass, capacity, time, and temperature,] using standard units – estimate, measure, and record length, height, [and distance,] using standard units (i.e., centimetre, [metre, kilometre]) – draw items using a ruler, given specific lengths in centimetres	***Teaching and Learning:*** Discuss with students the meanings of the words *length* (the measurement in a straight line from end to end of an object, e.g., length of a rope, length of a log), *height* (the measurement from the base to the top of an object, e.g., height of a bookcase, height of a tree), and *distance* (the measurement between two objects that are far apart, e.g., distance from home to school, distance between cities). Height and distance are both a type of length. Give students measurements in centimetres and have them draw lines.
Lesson 2: Measuring in Metres and Centimetres, pp. 108–109	• estimate, measure, and record length, [perimeter, area, mass, capacity, time, and temperature,] using standard units – estimate, measure, and record length, height, and distance, using standard units (i.e., centimetre, metre, [kilometre])	
Lesson 3: Comparing Lengths to a Kilometre, pp. 110–111	• estimate, measure, and record length, [perimeter, area, mass, capacity, time, and temperature,] using standard units • compare, describe, and order objects, using attributes measured in standard units – estimate, measure, and record length, height, and distance, using standard units (i.e., [centimetre], metre, kilometre) – represent and explain, [using concrete materials,] the relationship among the numbers 1, 10, 100, and 1000	
Lesson 4: Choosing an Appropriate Unit, pp. 112–113	• compare, describe, and order objects, using attributes measured in standard units – compare standard units of length (i.e., centimetre, metre, kilometre), and select and justify the most appropriate standard unit to measure length – compare and order objects on the basis of linear measurements in centimetres and/or metres in problem-solving contexts	
Lesson 5: Measuring Perimeter, pp. 114–115	• estimate, measure, and record length, perimeter, [area, mass, capacity, time, and temperature,] using standard units • compare, describe, and order objects, using attributes measured in standard units – estimate, measure, and record the perimeter of two-dimensional shapes, through investigation using standard units – compare and order objects on the basis of linear measurements in centimetres and/or metres in problem-solving contexts	
Mid-Chapter Review: p. 116		Assessment Opportunity
Curious Math: Comparing Body Lengths, p. 117		Optional
Lesson 6: Telling Analog Time, pp. 118–119	• [estimate,] measure, and record [length, perimeter, area, mass, capacity,] time, [and temperature,] using standard units – read time using analogue clocks, to the nearest five minutes, [and using digital clocks,] and represent time in 12-hour notation – solve problems involving the relationships between minutes and hours, [hours and days, days and weeks, and weeks and years, using a variety of tools]	
Lesson 7: Telling Digital Time, pp. 120–121	• [estimate,] measure, and record [length, perimeter, area, mass, capacity,] time, [and temperature,] using standard units – read time [using analogue clocks, to the nearest five minutes, and] using digital clocks, and represent time in 12-hour notation – solve problems involving the relationships between minutes and hours, [hours and days, days and weeks, and weeks and years, using a variety of tools]	
Lesson 8: Measuring How Time Passes, pp. 122–123		Beyond Grade 3 curriculum

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Content	Expectations	Addressing Expectations
Lesson 9: Solve Problems Using Charts, pp. 124–125	– solve problems involving the relationships between [minutes and hours], hours and days, days and weeks, and weeks and years, using a variety of tools	***Teaching and Learning:*** Extend this lesson by having students use a chart to determine the number of hours until an actitvity that will happen two or three days from now.
Lesson 10: Measuring Temperature, pp. 126–127	• estimate, measure, and record [length, perimeter, area, mass, capacity, time, and] temperature, using standard units – estimate, read (i.e., using a thermometer), and record positive temperatures to the nearest degree Celsius (i.e., using a number line; using appropriate notation) – identify benchmarks for freezing, cold, cool, warm, hot, and boiling temperatures as they relate to water and for cold, cool, warm, and hot temperatures as they relate to air	***Teaching and Learning:*** When the temperature for your area is above 0°C, have students record the temperature outside each day using a thermometer, and compare their measurements with those reported in the daily news. As a class, develop a chart of benchmarks for temperature (e.g., water freezes at 0°C; the air temperature on a warm day is about 20°C, and a hot day is over 30°C).
Math Game: Red Time, Blue Time, p. 128		Optional
Mental Math: Adding and Subtracting Hundreds, p. 129		Beyond Grade 3 curriculum
Skills Bank: pp. 130–131		Use Questions 1–8, 10–11.
Problem Bank: pp. 132–133		Use Questions 1–9, 11.
Chapter Review: pp. 134–135		Assessment Opportunity Use Questions 1–8, 10.
Chapter Task: Funny Olympics, p. 136	• estimate, measure, and record length, [perimeter, area, mass, capacity,] time, [and temperature,] using standard units – estimate, measure, and record length, [height,] and distance, using standard units (i.e., centimetre, metre, [kilometre]) – read time using analogue clocks, to the nearest five minutes, and using digital clocks, and represent time in 12-hour notation – compare and order objects on the basis of linear measurements in centimetres and/or metres in problem-solving contexts – solve problems involving the relationships between minutes and hours, [hours and days, days and weeks, and weeks and years,] using a variety of tools	Assessment Opportunity

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Chapter 6 Planning Chart: Adding and Subtracting with Greater Numbers

Content	Expectations	Addressing Expectations
Getting Started: Adding and Subtracting, pp. 138–139		Assessment Opportunity
Lesson 1: Estimating Sums, pp. 140–141	• solve problems involving the addition [and subtraction] of single- and multi-digit whole numbers, using a variety of strategies, [and demonstrate an understanding of multiplication and division] – round two-digit numbers to the nearest ten, in problems arising from real-life situations – use estimation when solving problems involving addition [and subtraction, to help judge the reasonableness of a solution]	***Teaching and Learning:*** In this lesson, students round sums of three-digit numbers to the nearest hundred and ten, which is beyond the Grade 3 curriculum. Introduce the lesson with estimating sums of two-digit numbers by rounding to the nearest ten. You may also want to simplify the lesson by replacing three-digit numbers with two-digit numbers and using a number line divided into tens.
Lesson 2: Adding with Base Ten Blocks, pp. 142–143	• solve problems involving the addition [and subtraction] of single- and multi-digit whole numbers, using a variety of strategies, [and demonstrate an understanding of multiplication and division] – solve problems involving the addition [and subtraction] of two-digit numbers, using a variety of [mental] strategies – add [and subtract] three-digit numbers, using concrete materials, student generated algorithms, [and standard algorithms]	For Question 6, have students estimate, then add, and then use their estimates to check the reasonableness of their answers.
Lesson 3: Adding 2-Digit and 3-Digit Numbers, pp. 144–146	• solve problems involving the addition [and subtraction] of single- and multi-digit whole numbers, using a variety of strategies, [and demonstrate an understanding of multiplication and division] – add [and subtract] three-digit numbers, using concrete materials, [student generated algorithms,] and standard algorithms	For Question 6, have students use their estimates to check their answers.
Curious Math: Checking Addition, p. 147		Optional
Lesson 4: Communicate a Solution to a Problem, pp. 148–149	• solve problems involving the addition [and subtraction] of single- and multi-digit whole numbers, using a variety of strategies, [and demonstrate an understanding of multiplication and division] – solve problems involving the addition and subtraction of two-digit numbers, [using a variety of mental strategies]	
Mid-Chapter Review: p. 150		Assessment Opportunity For Question 5, have students estimate, then add, and then use their estimates to check the reasonableness of their answers.
Mental Math: Adding and Subtracting Using Tens, p. 151		
Lesson 5: Estimating Differences, pp. 152–153	• solve problems involving the [addition and] subtraction of single- and multi-digit whole numbers, using a variety of strategies, [and demonstrate an understanding of multiplication and division] – use estimation when solving problems involving [addition and] subtraction, [to help judge the reasonableness of a solution]	
Lesson 6: Adding and Subtracting to Compare, p. 154	• solve problems involving the addition and subtraction of single- and multi-digit whole numbers, using a variety of strategies, [and demonstrate an understanding of multiplication and division] – [represent,] compare, and order whole numbers to 1000, using a variety of tools – add and subtract three-digit numbers, using concrete materials, student generated algorithms, and standard algorithms	
Math Game: Spill the Beans, p. 155		Optional
Lesson 7: Subtracting from 3-Digit Numbers, pp. 156–157	• solve problems involving the [addition and] subtraction of single- and multi-digit whole numbers, using a variety of strategies, [and demonstrate an understanding of multiplication and division] – [add and] subtract three-digit numbers, using concrete materials, [student generated algorithms,] and standard algorithms – use estimation when solving problems involving [addition and] subtraction, to help judge the reasonableness of a solution	***Teaching and Learning:*** After discussing how addition can be used to check subtraction in Reflecting Question 3, ask students how Michael could estimate to check the reasonableness of his subtraction. Then, for Question 6, have students use both methods to check their answers.

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Content	Expectations	Addressing Expectations
Lesson 8: Adding and Subtracting Money, pp. 158–159	• [read, represent, compare, and order whole numbers to 1000, and] use concrete materials to represent [fractions and] money amounts to $10 • solve problems involving the addition and subtraction of [single- and] multi-digit [whole] numbers, using a variety of strategies, [and demonstrate an understanding of multiplication and division] – [estimate, count, and] represent (using the $ symbol) the value of a collection of coins and bills with a maximum value of $10 – use estimation when solving problems involving addition and subtraction, to help judge the reasonableness of a solution – add and subtract money amounts, using a variety of tools, to make simulated purchases [and change] for amounts up to $10	
Lesson 9: Calculating Change, pp. 160–161	• [read, represent, compare, and order whole numbers to 1000, and] use concrete materials to represent fractions and money amounts to $10 • solve problems involving the addition and subtraction of [single- and] multi-digit [whole] numbers, using a variety of strategies, [and demonstrate an understanding of multiplication and division] – [estimate,] count, and represent (using the $ symbol) the value of a collection of coins and bills with a maximum value of $10 – add and subtract money amounts, using a variety of tools, to make simulated purchases and change for amounts up to $10	
Lesson 10: Choosing a Calculation Method, p.162	• solve problems involving the addition and subtraction of single- and multi-digit whole numbers, using a variety of strategies, [and demonstrate an understanding of multiplication and division] – solve problems involving the addition and subtraction [of two-digit numbers], using a variety of mental strategies – add and subtract three-digit numbers, using concrete materials, student generated algorithms, and standard algorithms – use estimation when solving problems involving addition and subtraction, to help judge the reasonableness of a solution	
Math Game: Digit Difference, p. 163		Optional
Skills Bank: pp. 164–165		
Problem Bank: pp. 166–167		
Chapter Review: pp. 168–169		Assessment Opportunity
Chapter Task: Marble Mania, p. 170	• solve problems involving the addition and subtraction of single- and multi-digit whole numbers, using a variety of strategies, [and demonstrate an understanding of multiplication and division] – represent, compare, and order whole numbers to 1000, using a variety of tools – solve problems involving the addition and subtraction of two-digit numbers, using a variety of mental strategies – use estimation when solving problems involving addition and subtraction, to help judge the reasonableness of a solution – add and subtract money amounts, using a variety of tools, to make simulated purchases [and change] for amounts up to $10	Assessment Opportunity

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Chapter 7 Planning Chart: 2-D Geometry

Content	Expectations	Addressing Expectations
Getting Started: Exploring Shapes, pp. 172–173		Assessment Opportunity
Lesson A: Exploring Pattern Block Puzzles, Supplement, p. 50	– solve problems requiring the greatest or least number of two-dimensional shapes (e.g., pattern blocks) needed to compose a larger shape in a variety of ways	New Lesson
Lesson 1: Exploring Tangrams, pp. 174–175	• compare two-dimensional shapes [and three-dimensional figures] and sort them by their geometric properties • describe relationships between two-dimensional shapes, [and between two-dimensional shapes and three-dimensional figures] – identify and compare various polygons (i.e., triangles, quadrilaterals, [pentagons, hexagons, heptagons, octagons]) and sort them by their geometric properties (i.e., number of sides; side lengths; [number of interior angles; number of right angles])	
Curious Math: Making Shapes with Tans, p. 175	– solve problems requiring the greatest or least number of two-dimensional shapes needed to compose a larger shape in a variety of ways	
Lesson 2: Describing Congruent Shapes, pp. 176–177	• compare two-dimensional shapes [and three-dimensional figures] and sort them by their geometric properties • describe relationships between two-dimensional shapes, [and between two-dimensional shapes and three-dimensional figures] – solve problems requiring the [greatest or least] number of two-dimensional shapes needed to compose a larger shape in a variety of ways – identify congruent two-dimensional shapes by manipulating and matching concrete materials	
Lesson B: Classifying Angles, Supplement, pp. 52–53	• compare two-dimensional shapes [and three-dimensional figures] and sort them by their geometric properties – use a reference tool to identify right angles and to describe angles as greater than, equal to, or less than a right angle – identify and compare various polygons (i.e., triangles, quadrilaterals, [pentagons,] hexagons, [heptagons, octagons]) and sort them by their geometric properties (i.e., [number of sides; side lengths; number of interior angles;] number of right angles) – compare various angles, using concrete materials and pictorial representations, and describe angles as bigger than, smaller than, or about the same as other angles	New Lesson
Lesson C: Polygons, Supplement, pp. 55–56	• compare two-dimensional shapes [and three-dimensional figures] and sort them by their geometric properties • describe relationships between two-dimensional shapes, [and between two-dimensional shapes and three-dimensional figures] – identify and compare various polygons (i.e., triangles, quadrilaterals, pentagons, hexagons, heptagons, octagons) and sort them by their geometric properties (i.e., number of sides; side lengths; number of interior angles; number of right angles)	New Lesson
Lesson 3: Symmetry, pp. 178–179	– [complete and] describe designs and pictures of images that have a vertical, horizontal, or diagonal line of symmetry	Use prompts A–D, Questions 1–4.
Lesson D: Drawing Designs with Symmetry, Supplement, p. 58	– complete and describe designs and pictures of images that have a vertical, horizontal, or diagonal line of symmetry	New Lesson
Lesson 4: Communicate About Symmetry, pp. 180–181	• [complete and] describe designs and pictures of images that have a vertical, horizontal, or diagonal line of symmetry	
Mid-Chapter Review: p. 182		Assessment Opportunity
Mental Imagery: Making Squares, p. 183		Optional

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Content	Expectations	Addressing Expectations
Lesson 5: Sorting 2-D Shapes, pp. 184–185	• compare two-dimensional shapes [and three-dimensional figures] and sort them by their geometric properties • describe relationships between two-dimensional shapes, [and between two-dimensional shapes and three-dimensional figures] – [identify and] compare various polygons (i.e., triangles, quadrilaterals, [pentagons,] hexagons, [heptagons,] octagons) and sort them by their geometric properties (i.e., number of sides; side lengths; number of interior angles; number of right angles) – explain the relationships between different types of quadrilaterals	***Teaching and Learning:*** Introduce the lesson by discussing the definitions of trapezoid, parallelogram, rectangle, rhombus, and square. (See the Glossary in the Student Book.) For each of these parallelograms, have students identify parallel sides, equal sides, equal angles, and right angles. For each shape, ask students to identify all the quadrilateral names that describe the shape (e.g., a square is also a parallelogram, a rhombus). Also remind students that the types and number of angles in a shape are attributes of the shape. Encourage students compare shapes by comparing angles (e.g., the angles in a square are bigger than the angles in this triangle ▲).
Lesson 6: Geometry Patterns, pp. 186–187	• describe, extend, and create a variety of numeric patterns and geometric patterns – identify, extend, and create a repeating pattern involving two attributes, using a variety of tools – extend repeating, [growing, and shrinking] number patterns – demonstrate, through investigation, an understanding that a pattern results from [repeating an action,] repeating an operation, [using a transformation,] or making some other repeated change to an attribute	
Skills Bank: pp. 188–189		
Problem Bank: p. 190		
Chapter Review: p. 191		Assessment Opportunity: Use Questions 1–3, 5–6.
Chapter Review: Supplement, p. 60		New Assessment Opportunity
Chapter Task: Creating a Mosaic, p. 192	– identify and compare various polygons (i.e., triangles, quadrilaterals, pentagons, hexagons, heptagons, octagons) [and sort them] by their geometric properties (i.e., number of sides; side lengths; number of interior angles; number of right angles) – solve problems requiring [the greatest or least number of] two-dimensional shapes needed to compose a larger shape in a variety of ways – identify congruent two-dimensional shapes by manipulating and matching concrete materials – [complete and] describe designs [and pictures of images] that have a vertical, horizontal, or diagonal line of symmetry	Assessment Opportunity
Chapters 4–7 Cumulative Review: pp. 193–194		Assessment Opportunity: Use Questions 1, 3–5, 7–9 e). For Question 9 c), have students sort by right angles rather than by symmetry.

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Chapter 8 Planning Chart: Area and Grids

Content	Expectations	Addressing Expectations
Getting Started: Classroom Areas, pp. 196–197		Assessment Opportunity
Lesson 1: Exploring Area, p. 198	• [estimate,] measure, and record [length, perimeter,] area, [mass, capacity, time, and temperature] using standard units] – compare and order various shapes by area, using congruent shapes [and grid paper] for measuring	
Lesson 2: Measuring Area with Square Units, p. 199	• estimate, measure, and record [length, perimeter,] area, [mass, capacity, time, and temperature, using standard units] – estimate, measure (i.e., using [centimetre grid paper,] arrays), and record area – describe, [through investigation using grid paper,] the relationship between the size of a unit of area and the number of units needed to cover a surface	Optional Encourage students to count the number of squares in each row and use repeated addition to determine the number of squares in the array, rather than counting all of the squares.
Lesson A: Measuring Area with Grid Paper, Supplement, p. 62	• [estimate,] measure, and record [length, perimeter,] area, [mass, capacity, time, and temperature, using standard units] – [estimate,] measure (i.e., using centimetre grid paper, arrays), and record area – describe, through investigation using grid paper, the relationship between the size of a unit of area and the number of units needed to cover a surface	New Lesson
Lesson 3: Counting Square Units, pp. 200–201	• estimate, measure, and record [length, perimeter,] area, [mass, capacity, time, and temperature,] using standard units – estimate, measure (i.e., using [centimetre] grid paper, [arrays]), and record area – compare and order various shapes by area, using [congruent shapes and] grid paper for measuring	***Teaching and Learning:*** Have students sketch the designs on 1 cm grid paper. Explain that the squares with 1 cm sides are called square centimetres (cm^2), and this is a standard unit for measuring area. Have students express the areas in square centimetres (cm^2). They can repeat this for all of the designs in the lesson.
Lesson 4: Solve Problems Using a Model, pp. 202–203	• [estimate,] measure, and record [length, perimeter,] area, [mass, capacity, time, and temperature] using standard units – compare and order various shapes by area, using [congruent shapes and] grid paper for measuring	
Lesson 5: Moving on a Grid, pp. 204–205	• identify and describe the locations and movements of shapes and objects – describe movement from one location to another using a grid map	
Mental Imagery: Areas of Unusual Shapes, p. 206		Optional
Math Game: Roll to the Star, p. 207		Optional
Skills Bank: pp. 208–209		For Questions 3 and 4, have students sketch the designs on 1 cm grid paper and express the areas in square centimetres (cm^2). For Question 5, have students use 10 square centimetres (cm^2).
Problem Bank: pp. 210–211		For Questions 3 and 4, have students use 1 cm grid paper and express the areas in square centimetres (cm^2). For Question 5, students may measure and record the areas in square centimetres (cm^2).
Chapter Review: pp. 212–213		Assessment Opportunity For Question 2, have students sketch the letters on 1 cm grid paper and express the areas in square centimetres (cm^2).
Chapter Task: Placing Furniture, p. 214	• [estimate,] measure, and record [length, perimeter,] area, [mass, capacity, time, and temperature,] using standard units • identify and describe the locations and movements of shapes and objects – [estimate,] measure (i.e., using [centimetre] grid paper, [arrays]), and record area – describe movement from one location to another using a grid map	Assessment Opportunity

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Chapter 9 Planning Chart: Multiplication

Content	Expectations	Addressing Expectations
Getting Started: Equal Groups and Repeated Addition, pp. 216–217		Assessment Opportunity
Lesson 1: Using Adding to Multiply, pp. 218–219	• [solve problems involving the addition and subtraction of single- and multi-digit whole numbers, using a variety of strategies, and] demonstrate an understanding of multiplication [and division] – relate multiplication of one-digit numbers [and division by one-digit divisors] to real life situations, using a variety of tools and strategies – identify and describe, through investigation, number patterns involving addition, [subtraction,] and multiplication, represented on a number line, on a calendar, and on a hundreds chart – multiply to 7×7 [and divide to $49 \div 7$], using a variety of mental strategies	***Teaching and Learning:*** Reflecting Question 2 introduces the multiplicative identity, 1, which is explored further in Lessons 3 and A. Encourage students to identify and describe patterns they observe skip counting by various numbers on a number line. ***Checking and Practising:*** Have students represent any of the multiplication sentences on a number line, a 100 chart, and a calendar. Have them describe the patterns.
Lesson 2: Solve Problems by Guessing and Testing, pp. 220–221	• [solve problems involving the addition and subtraction of single- and multi-digit whole numbers, using a variety of strategies, and] demonstrate an understanding of multiplication [and division] – relate multiplication of one-digit numbers [and division by one-digit divisors] to real life situations, using a variety of tools and strategies	
Lesson 3: Arrays and Multiplication, pp. 222–223	• [solve problems involving the addition and subtraction of single- and multi-digit whole numbers, using a variety of strategies, and] demonstrate an understanding of multiplication [and division] – relate multiplication of one-digit numbers [and division by one-digit divisors] to real life situations, using a variety of tools and strategies – multiply to 7×7 [and divide to $49 \div 7$], using a variety of mental strategies	***Teaching and Learning:*** Question 9 asks students to model an array for a product with 1 as a factor, which is also explored in Lesson A. ***Checking:*** Relate the multiplication facts and arrays to the concept of area from the previous chapter (e.g., the area of the array is $3 \times 7 = 21$ stickers).
Lesson A: Multiplying by 0 and 1, Supplement, p. 64	• [solve problems involving the addition and subtraction of single- and multi-digit whole numbers, using a variety of strategies, and] demonstrate an understanding of multiplication [and division] – identify, through investigation, the properties of zero and one in multiplication (i.e., any number multiplied by zero equals zero; any number multiplied by 1 equals the original number) – relate multiplication of one-digit numbers [and division by one-digit divisors] to real life situations, using a variety of tools and strategies	New Lesson
Mid-Chapter Review: p. 224		Assessment Opportunity To review Lesson A: **8.** Complete each multiplication fact. **a)** $1 \times 7 =$ ■ **c)** $1 \times 9 =$ ■ **b)** $0 \times 6 =$ ■ **d)** $0 \times 8 =$ ■ Answers: **8. a)** 7 **b)** 0 **c)** 9 **d)** 0
Math Game: Tap It Out, p. 225		Optional
Curious Math: Odd Arrays, p. 225		Optional
Lesson 4: Doubling, pp. 226–227	• [solve problems involving the addition and subtraction of single- and multi-digit whole numbers, using a variety of strategies, and] demonstrate an understanding of multiplication [and division] – relate multiplication of one-digit numbers [and division by one-digit divisors] to real life situations, using a variety of tools and strategies – multiply to 7×7 [and divide to $49 \div 7$], using a variety of mental strategies	***Teaching and Learning:*** Extend the lesson to include the strategy of doubling and then adding another set. Draw a 6×3 array on the board. Make sure the bottom three rows are slightly separated from the top three. Ask students how they can use the fact $3 \times 3 = 9$ to quickly figure out the number represented by the array. Add one more row to represent 7×3. Ask students why they might just add 3 to their previous answer. (double $3 \times 3 + 3 = 7 \times 3$) Point out how 5×9 can be calculated in a similar way: double 2×9 and add 9.
Lesson 5: Relating Multiplication Facts, pp. 228–229	• [solve problems involving the addition and subtraction of single- and multi-digit whole numbers, using a variety of strategies, and] demonstrate an understanding of multiplication [and division] – relate multiplication of one-digit numbers [and division by one-digit divisors] to real life situations, using a variety of tools and strategies – multiply to 7×7 [and divide to $49 \div 7$], using a variety of mental strategies	***Teaching and Learning:*** Relate multiplication to students' daily life by asking questions such as "Give a real-life example of when you might need to know that 3 groups of 2 is 3×2."

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Content	Expectations	Addressing Expectations
Lesson 6: Making a Multiplication Table, pp. 230–231	• [solve problems involving the addition and subtraction of single- and multi-digit whole numbers, using a variety of strategies, and] demonstrate an understanding of multiplication [and division] – identify and describe, through investigation, number patterns involving [addition, subtraction, and] multiplication, [represented on a number line, on a calendar, and on a hundreds chart]	
Mental Math: Mental Subtraction, p. 231		Use Questions 1 a)–g).
Skills Bank: pp. 232–233		
Problem Bank: p. 234		
Chapter Review: p. 235		Assessment Opportunity To review Lesson A: **7.** Multiply $1 by 5, 1, and 0. Answers: **7.** $5, $1, $0
Chapter Task: Products and Sums, p. 236	• [solve problems involving the addition and subtraction of single- and multi-digit whole numbers, using a variety of strategies, and] demonstrate an understanding of multiplication [and division] – identify and describe, through investigation, number patterns involving addition, [subtraction,] and multiplication, [represented on a number line, on a calendar, and on a hundreds chart]	Assessment Opportunity

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Chapter 10 Planning Chart: Division

Content	Expectations	Addressing Expectations
Getting Started: Sharing Tickets, pp. 238–239		Assessment Opportunity
Lesson 1: Sharing to Divide, pp. 240–241	• [solve problems involving the addition and subtraction of single- and multi-digit whole numbers, using a variety of strategies, and] demonstrate an understanding of [multiplication and] division – divide [whole objects and] sets of objects into equal parts, [and identify the parts using fractional names, without using numbers in standard fractional notation] – relate [multiplication of one-digit numbers and] division by one-digit divisors to real life situations, using a variety of tools and strategies	
Lesson 2: Grouping to Divide, pp. 242–243	• [solve problems involving the addition and subtraction of single- and multi-digit whole numbers, using a variety of strategies, and] demonstrate an understanding of [multiplication and] division – divide [whole objects and] sets of objects into equal parts, [and identify the parts using fractional names, without using numbers in standard fractional notation] – relate [multiplication of one-digit numbers and] division by one-digit divisors to real life situations, using a variety of tools and strategies – [multiply to 7×7 and] divide to $49 \div 7$, using a variety of mental strategies	
Lesson 3: Communicate About Division, pp. 244–245	• [solve problems involving the addition and subtraction of single- and multi-digit whole numbers, using a variety of strategies, and] demonstrate an understanding of [multiplication and] division – divide [whole objects and] sets of objects into equal parts, [and identify the parts using fractional names, without using numbers in standard fractional notation] – relate [multiplication of one-digit numbers and] division by one-digit divisors to real life situations, using a variety of tools and strategies	***Teaching and Learning:*** Relate division to students' daily life by asking questions such as "Give a real-life example of when you might need to know that 6 divided into 3 equal groups is 2."
Mid-Chapter Review: p. 246		Assessment Opportunity
Math Game: Fill-a-Row Division, p. 247		Optional
Lesson 4: Exploring Division Patterns, p. 248	• [solve problems involving the addition and subtraction of single- and multi-digit whole numbers, using a variety of strategies, and] demonstrate an understanding of [multiplication and] division – [multiply to 7×7 and] divide to $49 \div 7$, using a variety of mental strategies – count backwards by 2s, 5s, and 10s [from 100] using multiples of 2, 5, and 10 as starting points, [and count backwards by 100s from 1000 and any number less than 1000, using a variety of tools and strategies]	Optional Use prompts A–C, which explore patterns when counting backwards by 2s, 5s, and 10s.
Mental Math: Using Equal Groups, p. 249		Optional
Lesson 5: Estimating Quotients, pp. 250–251		Beyond Grade 3 curriculum
Lesson 6: Division Strategies, pp. 252–253		Beyond Grade 3 curriculum
Skills Bank: pp. 254–255		Use Questions 1–8.
Problem Bank: p. 256		Use Questions 1–7.
Chapter Review: p. 257		Assessment Opportunity: Use Questions 1–8.
Chapter Task: Dividing a Recipe, p. 258	• [solve problems involving the addition and subtraction of single- and multi-digit whole numbers, using a variety of strategies, and] demonstrate an understanding of [multiplication and] division – divide whole objects [and sets of objects] into equal parts, [and identify the parts using fractional names, without using numbers in standard fractional notation] – relate [multiplication of one-digit numbers and] division by one-digit divisors to real life situations, using a variety of tools and strategies – [multiply to 7×7 and] divide to $49 \div 7$, using a variety of mental strategies	Assessment Opportunity

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Chapter 11 Planning Chart: 3-D Geometry and 3-D Measurement

Content	Expectations	Addressing Expectations
Getting Started: Describing 3-D Shapes, pp. 260–261		Assessment Opportunity
Lesson 1: Stacking Shapes to Make Prisms, pp. 262–263	• compare [two-dimensional shapes and] three-dimensional figures and sort them by their geometric properties • describe relationships [between two-dimensional shapes, and] between two-dimensional shapes and three-dimensional figures – compare and sort prisms [and pyramids] by geometric properties (i.e., number and shape of faces, [number of edges, number of vertices]), using concrete materials – identify and describe the two-dimensional shapes that can be found in a three-dimensional figure – describe and name prisms [and pyramids] by the shape of their base	
Lesson 2: Identifying Faces of Prisms and Pyramids, pp. 264–265	• compare [two-dimensional shapes and] three-dimensional figures and sort them by their geometric properties • describe relationships [between two-dimensional shapes, and] between two-dimensional shapes and three-dimensional figures – compare and sort prisms and pyramids by geometric properties (i.e., number and shape of faces, [number of edges, number of vertices]), using concrete materials – identify and describe the two-dimensional shapes that can be found in a three-dimensional figure – describe and name prisms and pyramids by the shape of their base	
Lesson 3: Using Nets for Rectangle-Based Prisms, pp. 266–267	• describe relationships [between two-dimensional shapes, and] between two-dimensional shapes and three-dimensional figures – compare and sort prisms [and pyramids] by geometric properties (i.e., number and shape of faces, number of edges, number of vertices), using concrete materials – construct rectangular prisms, and describe geometric properties (i.e., number and shape of faces, number of edges, number of vertices) of the prisms	***Teaching and Learning:*** Provide students with extra practice by supplying them with some paper nets for rectangle based prisms to cut out and assemble, and then describe the geometric properties of the prisms.
Curious Math: Drawing 3-D Shapes, p. 267	– identify and describe the two-dimensional shapes that can be found in a three-dimensional figure	Optional
Lesson 4: Building with 3-D Shapes, p. 268	• identify and describe the locations [and movements] of shapes and objects – compare and sort prisms and pyramids by geometric properties (i.e., number and shape of faces, number of edges, number of vertices), using concrete materials – identify and describe the two-dimensional shapes that can be found in a three-dimensional figure – describe and name prisms and pyramids by the shape of their base	***Teaching and Learning:*** Have pairs of students trade their descriptions and attempt to build their partner's structure from its description.
Math Game: I Spy, p. 269	– identify and describe the two-dimensional shapes that can be found in a three-dimensional figure	
Mid-Chapter Review: p. 270		Assessment Opportunity
Mental Imagery: Estimating by Comparing, p. 271		Optional
Lesson 5: Estimating and Measuring Capacity, pp. 272–273		Beyond Grade 3 curriculum
Lesson A: Estimating and Measuring Capacity, Supplement, pp. 66–67	• estimate, measure, and record [length, perimeter, area, mass,] capacity, [time, and temperature,] using standard units • compare, describe, and order objects, using attributes measured in standard units – choose benchmarks for [a kilogram and] a litre to help them perform measurement tasks – estimate, measure, and record the capacity of containers, using the standard unit of the litre or parts of a litre – compare and order a collection of objects, using standard units of [mass (i.e., kilogram) and/or] capacity (i.e., litre)	New Lesson

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Content	Expectations	Addressing Expectations
Lesson 6: Solve Problems About Combinations, pp. 274–275	– estimate, measure, and record the capacity of containers, using the standard unit of the litre [or parts of a litre]	Replace Practising Questions 4–6 with the following: **4.** Ari has 4 pitchers. They hold 1 L, 2 L, 4 L, and 6 L. What possible amounts can he measure without refilling the vases? **5.** Shin has a 1 L, 4 L, 5 L, and 9 L container. He needs to fill a 24 L barrel with water. He wants to use only 2 containers and pour as few times as possible. Which 2 containers should he choose? Answers: **4.** 1 L, 2 L, 3 L, 4 L, 5 L, 6 L, 7 L, 8 L, 10 L, 12 L **5.** 5 L and 4 L
Lesson 7: Estimating and Measuring Mass, pp. 276–277		Beyond Grade 3 curriculum
Lesson B: Estimating and Measuring Mass, Supplement, pp. 69–70	• estimate, measure, and record [length, perimeter, area,] mass, [capacity, time, and temperature,] using standard units • compare, describe, and order objects, using attributes measured in standard units – choose benchmarks for a kilogram [and a litre] to help them perform measurement tasks – estimate, measure, and record the mass of objects, using the standard unit of the kilogram or parts of a kilogram – compare and order a collection of objects, using standard units of mass (i.e., kilogram) [and/or capacity (i.e., litre)]	New Lesson
Skills Bank: pp. 278–279		Use Questions 1–5.
Problem Bank: p. 280		Use Questions 1–5.
Chapter Review: p. 281		Assessment Opportunity Use Questions 1–3, 5–6. To review Lesson A: **9.** Identify 2 containers that have a capacity of exactly 1 L. Choose 3 other containers and describe the capacity as less than 1 L, about 1 L, or greater than 1 L. To review Lesson B: **10.** Describe 2 objects that have a mass of about 1 kg. Choose 3 other objects and describe the mass of each as less than 1 kg, about 1 kg, or greater than 1 kg. Answers: **9.** For example, water bottle, measuring cup; For example, pop bottle, about a litre and a half; milk glass, about a quarter litre; water pitcher, greater than a litre **10.** For example, a book, a boot; For example, a stapler, less than 1 kg; backpack, greater than 1 kg; dictionary, about a kilogram and a half
Chapter Task: Making Pet Shapes, p. 282	• estimate, measure, and record [length, perimeter, area,] mass, [capacity, time, and temperature,] using standard units – estimate, measure, and record the mass of objects, using the standard unit of the kilogram [or parts of a kilogram] – construct rectangular prisms, and describe geometric properties (i.e., number and shape of faces, number of edges, number of vertices) of the prisms – identify and describe the two-dimensional shapes that can be found in a three-dimensional figure – describe and name prisms and pyramids by the shape of their base	Assessment Opportunity The recipe uses millilitres, which are beyond the Grade 3 curriculum. Either prepare the dough yourself, or provide students with the following recipe: **Pet Maker Dough** Use a small cup and a large table spoon for measuring. flour 2 cupfuls salt 1 cupful water 1 cupful vegetable oil 1 spoonful …etc., as per recipe in Student Book
Chapters 8–11 Cumulative Review: pp. 283–284		Use Questions 1–4, 6–8.

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Chapter 12 Planning Chart: Fractions

Ch.12 note: Fraction notation is beyond Grade 3 curriculum. Some students may be familiar with it and may use it, but it is not an expectation to be assessed at this level.

Content	Expectations	Addressing Expectations
Getting Started: Common Fractions, pp. 286–287		Beyond Grade 2 curriculum
Getting Started: Common Fractions, Supplement, pp. 72–73		New Getting Started
Lesson 1: Fractions as Parts of a Group, pp. 288–289		Beyond Grade 3 curriculum
Lesson 2: Fractions as Parts of a Whole, pp. 290–291		Beyond Grade 3 curriculum
Lesson A: Fractions as Parts of a Whole, Supplement, pp. 75–76	• [read, represent, compare, and order whole numbers to 1000, and] use concrete materials to represent fractions [and money amounts to $10] • divide whole objects [and sets of objects] into equal parts, and identify the parts using fractional names, without using numbers in standard fractional notation	New Lesson
Lesson B: Fractions as Parts of a Group, Supplement, pp. 78–79	• [read, represent, compare, and order whole numbers to 1000, and] use concrete materials to represent fractions [and money amounts to $10] • divide [whole objects and] sets of objects into equal parts, and identify the parts using fractional names, without using numbers in standard fractional notation	New Lesson
Lesson 3: Communicate Using Drawings, pp. 292–293	• [read, represent, compare, and order whole numbers to 1000, and] use concrete materials to represent fractions [and money amounts to $10] • divide whole objects [and sets of objects] into equal parts, and identify the parts using fractional names, without using numbers in standard fractional notation	
Mid-Chapter Review: p. 294		Assessment Opportunity Replace fraction notation with words in Questions 1, 2, 4, 5, & 6.
Math Game: Fraction Concentration, p. 295		Beyond Grade 3 curriculum. As an alternative, replace fraction notation with words.
Lesson 4: Fractions as Parts of a Measure, p. 296		Beyond Grade 3 curriculum
Curious Math: Fraction Neighbours, p. 297		Beyond Grade 3 curriculum. As an alternative, replace fraction notation with words.
Lesson 5: Mixed Numbers, pp. 298–299		Beyond Grade 3 curriculum
Mental Imagery: Building Fractions, p. 300		Beyond Grade 3 curriculum. As an alternative, replace fraction notation with words.
Skills Bank: pp. 301–302		Use Questions 1–7, & 9. Replace fraction notation with words in Questions 2, 7, 9.
Problem Bank: p. 303		Replace fraction notation with words in Questions 1, 3, 4, & 5.
Chapter Review: pp. 304–305		Assessment Opportunity Use Questions 1–9. Replace fraction notation with words in Questions 2, 7, 9.
Chapter Task: Designing a Storage Closet, p. 306	• [read, represent, compare, and order whole numbers to 1000, and] use concrete materials to represent fractions [and money amounts to $10] • divide [whole objects and] sets of objects into equal parts, and identify the parts using fractional names, without using numbers in standard fractional notation	Assessment Opportunity Replace fraction notation with words.

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Chapter 13 Planning Chart: Probability

Content	Expectations	Addressing Expectations
Getting Started: Probability Situations, pp. 308–309		Assessment Opportunity
Lesson 1: Conducting Experiments, pp. 310–311	• predict and investigate the frequency of a specific outcome in a simple probability experiment – predict the frequency of an outcome in a simple probability experiment or game, then perform the experiment, and compare the results with the predictions, using mathematical language	
Lesson 2: Communicate About Probability, pp. 312–313	• predict [and investigate] the frequency of a specific outcome [in a simple probability experiment] – predict the frequency of an outcome [in a simple probability experiment or game, then perform the experiment, and compare the results with the predictions,] using mathematical language	
Lesson 3: Making Predictions, pp. 314–315	• predict and investigate the frequency of a specific outcome in a simple probability experiment – predict the frequency of an outcome in a simple probability experiment or game, then perform the experiment, and compare the results with the predictions, using mathematical language – demonstrate, through investigation, an understanding of fairness in a game and relate this to the occurrence of equally likely outcomes	***Teaching and Learning:*** Ask students whether they think the ways Jack and Ben, and Tiffany and Sukan are deciding who will go first or win are fair.
Lesson A: Fairness in Games, Supplement, p. 81	• [predict and] investigate the frequency of a specific outcome in a simple probability experiment – demonstrate, through investigation, an understanding of fairness in a game and relate this to the occurrence of equally likely outcomes	New Lesson
Math Game: Off to the Races, p. 316	– demonstrate, through investigation, an understanding of fairness in a game and relate this to the occurrence of equally likely outcomes	Optional
Mental Imagery: Number Cubes, p. 317		Optional
Lesson 4: Probability Models, pp. 318–319	• predict and investigate the frequency of a specific outcome in a simple probability experiment – predict the frequency of an outcome in a simple probability experiment or game, then perform the experiment, and compare the results with the predictions, using mathematical language	
Curious Math: Spinning Red, p. 319		
Skills Bank: pp. 320–321		
Problem Bank: p. 322		
Chapter Review: p. 323		Assessment Opportunity
Chapter Task: Designing Spinners, p. 324	• predict and investigate the frequency of a specific outcome in a simple probability experiment – predict the frequency of an outcome in a simple probability experiment or game, then perform the experiment, and compare the results with the predictions, using mathematical language	Assessment Opportunity

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Chapter 14 Planning Chart: Patterns and Motion in Geometry

Content	Expectations	Addressing Expectations
Getting Started: Looking for Patterns, pp. 326–327		***Teaching and Learning:*** Flips, slides, and turns are beyond Grade 2 curriculum. Replace the text on Student Book p. 326 with the following: "Patterns have attributes, such as colour, size, and shape. What patterns can you see in the park scene?" Replace prompts A–C and Question 2 with the following: **1.** Create a shape pattern with pattern blocks. Describe your pattern.
Lesson 1: Sliding Shapes, pp. 328–329	• identify and describe the [locations and] movements of shapes and objects – identify congruent two-dimensional shapes by manipulating and matching concrete materials – identify [flips,] slides, [and turns,] through investigation using concrete materials and physical motion, and name [flips,] slides, [and turns] as [reflections,] translations, [and rotations] – describe movement from one location to another using a grid map	***Teaching and Learning:*** Review with students the definition of congruent (identical in size and shape). Introduce the term translation (a slide of a shape along a straight line). Use the activity in the Student Book, including the Reflecting questions. Replace the Checking and Practising questions in the Student Book with the new questions in the supplement (see below).
Lesson 1: Sliding Shapes, Supplement p. 83	• identify and describe the [locations and] movements of shapes and objects – identify congruent two-dimensional shapes by manipulating and matching concrete materials – identify [flips,] slides, [and turns,] through investigation using concrete materials and physical motion, and name [flips,] slides, [and turns] as [reflections,] translations, [and rotations] – describe movement from one location to another using a grid map	These questions replace the Checking and Practising questions in Lesson 1. Answers to these questions are on Supplement page 84.
Lesson A: Reflections, Supplement p. 85	• identify and describe the [locations and] movements of shapes and objects – identify congruent two-dimensional shapes by manipulating and matching concrete materials – identify flips, [slides, and turns,] through investigation using concrete materials and physical motion, and name flips, [slides, and turns] as reflections, [translations, and rotations]	New Lesson
Lesson 2: Flipping Shapes, pp. 330–331	• identify and describe the [locations and] movements of shapes and objects – identify congruent two-dimensional shapes by manipulating and matching concrete materials – identify flips, [slides, and turns,] through investigation using concrete materials and physical motion, and name flips, [slides, and turns] as reflections, [translations, and rotations]	Optional
Lesson 3: Turning Shapes, pp. 332–333	• identify and describe the [locations and] movements of shapes and objects – identify congruent two-dimensional shapes by manipulating and matching concrete materials – identify [flips, slides, and] turns, through investigation using concrete materials and physical motion, and name [flips, slides, and] turns as [reflections, translations, and] rotations	Replace fraction notation with words throughout the lesson. ***Teaching and Learning:*** Introduce the term rotation (a turn of a shape around a point, called the centre of rotation). Discuss with students how rotations can be used to identify congruent shapes. Replace Questions 3 and 4 in the Student Book with the new questions in the supplement (see below).
Lesson 3: Turning Shapes, Supplement pp. 87–88	• identify and describe the [locations and] movements of shapes and objects – identify congruent two-dimensional shapes by manipulating and matching concrete materials – identify [flips, slides, and] turns, through investigation using concrete materials and physical motion, and name [flips, slides, and] turns as [reflections, translations, and] rotations	These questions replace Questions 3 and 4 in Lesson 3. Answers to these questions are in Teacher's Resource, Chapter 14, page 23.
Mid-Chapter Review: p. 334		Assessment Opportunity: Replace fraction notation with words in Question 3.
Mental Imagery: Turning Bricks, p. 335		Optional Replace fraction notation with words.
Lesson 4: Communicate About Slides, Flips, and Turns, pp. 336–337	• identify and describe the [locations and] movements of shapes [and objects] – identify flips, slides, and turns, through investigation using concrete materials and physical motion, and name flips, slides, and turns as reflections, translations, and rotations	Replace fraction notation with words throughout the lesson. ***Teaching and Learning:*** Continue to model and reinforce the use of the terms translation, reflection, and rotation.

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Content	Expectations	Addressing Expectations
Lesson 5: Comparing Patterns, pp. 338–339	• identify and describe the [locations and] movements of shapes [and objects] • describe, extend, and create a variety of [numeric patterns and] geometric patterns – identify flips, slides, and turns, through investigation using concrete materials and physical motion, and name flips, slides, and turns as reflections, translations, and rotations – identify, extend, and create a repeating pattern involving two attributes, using a variety of tools – demonstrate, through investigation, an understanding that a pattern results from [repeating an action, repeating an operation,] using a transformation, or making some other repeated change to an attribute	
Lesson 6: Extending Patterns, p. 340	• describe, extend, and create a variety of [numeric patterns and] geometric patterns – identify, extend, and create a repeating pattern involving two attributes, using a variety of tools – demonstrate, through investigation, an understanding that a pattern results from [repeating an action, repeating an operation,] using a transformation, or making some other repeated change to an attribute	
Skills Bank: pp. 341–342		Replace fraction notation with words in Questions 3 & 4.
Problem Bank: p. 343		Replace fraction notation with words in Question 3.
Chapter Review: pp. 344–345		Assessment Opportunity Replace fraction notation with words in Question 2.
Chapter Task: Book Designs, p. 346	• identify and describe the [locations and] movements of shapes [and objects] – identify flips, slides, and turns, through investigation using concrete materials and physical motion, and name flips, slides, and turns as reflections, translations, and rotations	Assessment Opportunity
Chapters 12–14 Cumulative Review: pp. 347–348		Replace fraction notation with words in Questions 1, 5, & 7.

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New Lessons

Teacher's Resource

Mathematics 3
Ontario Supplement

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CHAPTER 1

A Action Patterns

Goal **Explore patterns made by repeated actions.**

Jessica made a pattern by repeating some actions.

Jessica's Pattern

I tapped my foot twice.

Then I shook my head once.

Then I clapped my hands once.

Then I repeated these actions in order.

? What action patterns can you create?

A. Choose two or three actions to use to make a pattern.

B. Create an action pattern.
Describe your action pattern.

C. Use the same actions to create a different pattern.
Describe the pattern.

D. Use different actions to make another pattern.
Describe the pattern.

Reflecting

1. Compare your action patterns. How are they the same? How are they different?

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A Action Patterns

Exploration

Assessment for Feedback	What You Will See Students Doing …	
Students will	**When Students Understand**	**If Students Misunderstand**
• use actions to represent patterns	• Students will create and describe patterns using actions.	• Some students may use actions randomly without demonstrating a pattern. Have them tell you which part of their pattern they are repeating.

1. Introduction (Whole Class) ▸ 5–10 min

Demonstrate action patterns for students. Ask students to identify which part of the pattern repeats, and then ask them to repeat the pattern using actions. Begin with a simple pattern (clap hands, stamp feet) and gradually move on to patterns with changing attributes (clap hands twice, stamp feet once, click tongue three times, and so on).

2. Teaching and Learning (Whole Class/Pairs) ▸ 25–35 min

Together read Jessica's Pattern in Lesson 1A. Read the central question, and then have students complete prompts A and B in pairs. Have pairs share their action patterns with the class, and then continue on to complete prompts C and D. Again, have students share their patterns, asking them to identify what parts of the patterns repeat.

Reflecting Use these questions to ensure that students understand how to create a pattern using actions.

Sample Discourse

1.
- *All my patterns were made by repeating a sequence of actions.*
- *My first two patterns used the same actions but in different combinations.*
- *My third pattern used different actions from the first two.*

3. Consolidation ▸ 10–15 min

Use Assessment Tool 6, Masters Booklet p. 7, to assess answers for this lesson.

Closing (Whole Class)
Have students take turns describing a pattern for the whole class to act out.

Answers

- **A.** For example, raising and lowering my right arm, tapping my desk with my right hand
- **B.** For example, raise arm, lower arm, tap desk twice, repeat
- **C.** For example, raise arm, lower arm, raise arm, lower arm, tap desk once, repeat
- **D.** For example, click tongue once, clap hands once, click tongue twice, clap hands once, repeat
- **1.** See sample answers under Reflecting.

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CHAPTER 2

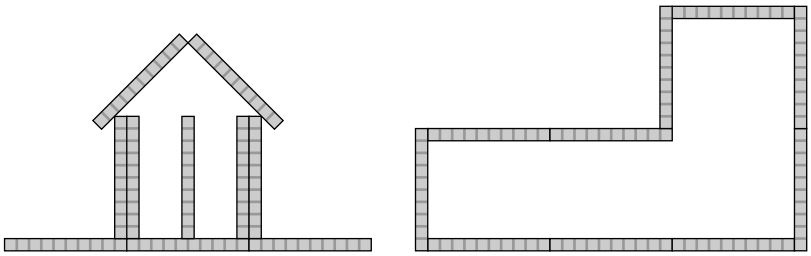
A Exploring 1000

You will need

- base ten blocks

Goal **Explore the relationships among 1, 10, 100, and 1000.**

Rose and Amit used tens blocks to make pictures worth 100.



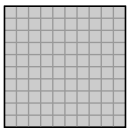
? How can you show the relationships among 1, 10, 100, and 1000?

A. How many tens blocks did Rose and Amit each use to make a picture worth 100? How many tens are in 100?

B. Use hundreds blocks to make a picture worth 1000. How many hundreds are in 1000?

C. Use tens blocks to make a picture worth 1000. How many tens are in 1000?

D. How many ones blocks would you need for making a picture worth 10? 100? 1000? Explain.



Reflecting

1. a) How did you decide how many hundreds blocks to use to show 1000?

b) How did you decide how many tens blocks to use to show 1000?

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A Exploring 1000

Exploration

Materials	• base ten blocks
Masters	• (manipulatives substitue) Base Ten Blocks:Ones; Tens; Hundreds, Masters, Booklet, pp. 35–37

Assessment for Feedback	What You Will See Students Doing …	
Students will	**When Students Understand**	**If Students Misunderstand**
• show the relationships among 1, 10, 100, and 1000	• Students will be able to represent and describe the relationships among 1, 10, 100, and 1000 using base ten blocks.	• Students may have difficulty seeing the relationship between 10 and 1000. Have them use base ten blocks to review the relationship between 1 and 10 before they move on to 10 and 100, 100 and 1000, and, finally, 10 and 1000.

1. Introduction (Whole Class) ▸ 5–10 min

Ask students to explain how they would model the number 10 with tens blocks. Then ask them whether they can model the number 10 using different base ten blocks. Prompt them to lay 10 ones blocks side by side and compare the row of 10 ones blocks to 1 tens block. Discuss how the two models are the same and different.

2. Teaching and Learning (Whole Class/Pairs) ▸ 25–35 min

Together read about Rose and Amit's pictures and the central question in Lesson 2A. Look at the pictures and ask students to compare them. Have students complete prompt A and discuss as a class. Students can work through prompts B to D in pairs. They can share their pictures with the whole class, explaining how they knew how many blocks to use for each picture.

Reflecting Use these questions to ensure that students understand the relationship between 100 and 1000, and between 10 and 1000.

Sample Discourse

1. a) • *I made a stack of hundreds blocks as high as a thousands block and then counted them.*

• *I skip counted by 100s to 1000 and counted how many times I skipped.*

b) • *I made a row of tens blocks the same size as a hundreds block and then counted them. Then I made another row of tens blocks on top of the first row. I did that over and over until my rows of tens blocks were as high as a thousands block. Then I counted all the tens blocks.*

• *I kept adding tens until I got to 1000. 10 + 10 = 20, that's 2 tens. 20 + 10 = 30, that's 3 tens, and so on.*

3. Consolidation ▸ 10–15 min

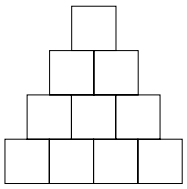
Use Assessment Tool 6, Masters Booklet p. 7, to assess answers for this lesson.

Closing (Whole Class)
Have students explain how many ones and tens blocks they would need to make pictures worth 10, 100, and 1000.

Answers

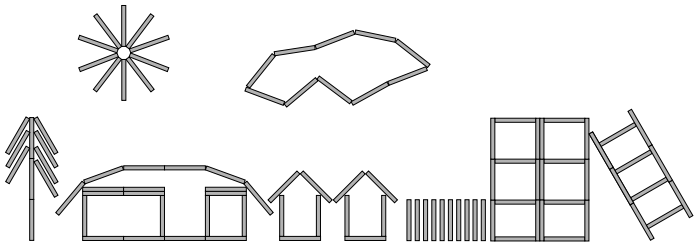
A. 10 tens blocks; 10 tens are in 100

B. For example,



10 hundreds are in 1000.

C. For example,



100 tens are in 1000.

D. 10 ones blocks; 100 ones blocks; 1000 ones blocks; for example, because 1 tens block is the same as 10 ones, 1 hundreds block is the same as 100 ones, and 1 thousands block is the same as 1000 ones

1. See sample answers under Reflecting.

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CHAPTER 2

B Counting Patterns

You will need

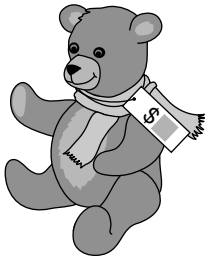
- play coins

- a calculator

Goal **Count by 2s, 5s, and 25s.**

Sharleen has 1 loonie and 7 quarters.

She buys a teddy bear and gets 3 nickels and 12 pennies in change.



? How much did the teddy bear cost?

Sharleen's Counting Patterns

A loonie is 100¢. A quarter is 25¢.

I'll start at 100 and count by 25s to figure out how much money I started with.

100 125 150 175 200 225 250 275

I started with $2.75.

I can count backward from 275 to see how much I spent. A nickel is 5¢. I'll count backward by 5s.

275 270 265 260 ...

I'll count the pennies by counting backward by 2s.

... 258 256 254 252 250 248

The teddy bear cost $2.48.

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Reflecting

1. Describe the patterns in the digits when you count.
   a) count by 25s
   b) count backward by 5s
   c) count backward by 2s

2. a) Why do you think Sharleen counted backward to find out how much she spent?
   b) Why do you think she counted the nickels first?

Checking

3. Devon has 1 toonie and 9 quarters. He buys a puzzle and gets 7 nickels and 14 pennies in change.
   a) How much money did he start with? Count by 25s.
   b) How much did the puzzle cost? Count backward by 5s and 2s.

Practising

4. a) Start at 100. Write the first 5 numbers for counting backward by 2s.
   b) Predict the ones digits in the next 6 numbers.
   c) Use a calculator to check your prediction.

100 − 2 = = = **and so on**

5. Start at 425 and count by 25s. Write the 9th number. Check using a calculator.

6. Charlie used a calculator to count backward from 75 by 5s.
   a) Predict the first 10 numbers on the calculator display.
   b) Do you think the calculator display will show the number zero? Explain why or why not. Check using a calculator.

7. Start at 93 and count forward by 2s. Count until you reach a number greater than 110.

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B Counting Patterns

Direct Instruction

Materials	• play coins, calculators
Masters	• (manipulatives substitue) Play Money 1 and 2, Masters, Booklet, pp. 28–29

Assessment for Feedback	What You Will See Students Doing …	
Students will	**When Students Understand**	**If Students Misunderstand**
• count forward and backward by 2s, 5s, and 25s	• Students will use coins to model counting by 2s and 5s, starting at any number, and by 25s, starting at any multiple of 25.	• Some students may be able to count by 2s, 5s, and 25s but may not understand the pattern. Encourage students to identify and explain the pattern when counting, rather than simply memorizing a set of numbers.

1. Introduction (Whole Class) ▸ 5–10 min

Review counting forward and backward with students by playing the game "Buzz." Students count by 1s as they sit in a circle or at their desks arranged in a circle. The first student says "one," the next "two," and so on. Whenever a student counts a multiple of 5, the student must say "buzz" instead of the number. Continue playing until you have reached 100.

2. Teaching and Learning (Whole Class) ▸ 15–20 min

Write counting patterns on the board, one term at a time, as you elicit the terms from students. Start with 2s, then move on to 5s and then 25s. Once you have written 10 terms for each pattern, count backward as well. Circle the ones digits in each column of numbers, and then ask students to explain any patterns they see.

Ask students to turn to Lesson 2B. As a class, read about Sharleen's purchase and the central question. Discuss with students if they have purchased something by using a large collection of coins. Explain that there are different ways to count coins and that counting by 2s, 5s, and 25s is one strategy.

Together read Sharleen's Counting Patterns. Discuss why Sharleen started her pattern at 100.

Reflecting Use these questions to ensure that students can recognize and identify patterns in numbers when they count forward and backward.

Sample Discourse

1. a) • *The ones digits go 5, 0, and repeat. The tens digits go 2, 5, 7, 0, and repeat. The hundreds digits go 0, 0, 0, 1, 1, 1, 1, 2, 2, 2, 2, and so on.*

b) • *The ones digits go 0, 5, or 5, 0, depending on what number you start counting back from, and repeat. The tens digits go down by one every two times.*

c) • *The ones digits go 0, 8, 6, 4, 2, and repeat.*

2. a) • *Sharleen counted backward from how much she had started with until she reached the amount that was left. The amount she counted was the amount she spent.*

• *Counting backward is like subtracting.*

b) • *She was counting back from 275, and it's easier to count back by 5s from 275 than by 2s.*

• *People usually count the coins that are worth the most first.*

3. Consolidation ▸ 25–30 min

Checking (Pairs)

3. Provide play coins for students who want to use them.

a) Encourage students to group their coins in $1 groups as they count.

Practising (Individual)

4. You may need to review the constant function on a calculator with students. Start with a simple addition, such as +1. Have students press [+] 1 [=] [+] 1 [=] [+] 1 [=] [+] 1 [=], stopping after each [=] to read the number displayed. Then have them press [+] 1 [=] [=] [=] [=] and compare the results.

Use Assessment Tools 7 and 8, Masters Booklet pp. 8 and 9, to assess answers for this key assessment question.

5. Students may consider 425 the first number, since that is how the pattern starts, or they may consider 450 the first number, since it is the first number they generate by pressing [+] 25 [=].

7. Provide play coins or number lines.

Closing (Whole Class)

Write 100 on the board and ask, "Am I counting by 2s, 5s, or 25s, if 100 is part of my counting pattern? How do you know?"

Answers

1. & 2. See sample answers under Reflecting.

3. a) $4.25; 200, 225, 250, 275, 300, 325, 350, 375, 400, 425

b) $3.76; 420, 415, 410, 405, 400, 395, 390, 388, 386, 384, 382, 380, 378, 376

4. a) 100, 98, 96, 94, 92

b) 0, 8, 6, 4, 2, 0

c) 90, 88, 86, 84, 82, 80; for example, my prediction is correct.

5. 625 or 650

6. a) 75, 70, 65, 60, 55, 50, 45, 40, 35, 30

b) For example, yes, because the pattern in the ones digits goes 5, 0, 5, 0, 5, 0, so 0 will be the last number in the pattern.

7. 93, 95, 97, 99, 101, 103, 105, 107, 109, 111

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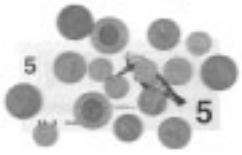
C

Estimating and Counting Money

You will need

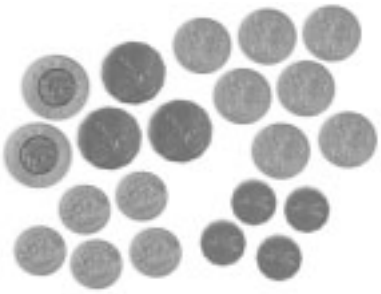
- play money



Goal **Estimate, count, and relate coins and bills.**

Sukan and Juan each have money to spend at the school book fair.

Sukan's money



Juan's money

? Who has more money: Sukan or Juan?

Sukan's Money

First I'll estimate.

A $5 bill and 1 toonie and 1 loonie is $5 + $2 + $1.
I have $8 and a bit more.

Then I'll count my money.

I have $8 and 2 quarters, 3 dimes, and 1 nickel.
That's 8 dollars and 25¢, 50¢, 60¢, 70¢, 80¢, 85¢.

I have $8.85.

$5.00

$10.00

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A. Estimate how much money Juan has.
Explain how you estimated.

B. Count Juan's money. Show your work.

C. Who has more money? How do you know?

Reflecting

1. What bills or coins did you not count when you estimated? Why not?

2. **a)** How can you show how much money Sukan has using only coins?
b) How can you show how much money Juan has using bills *and* coins?

Checking

3. **a)** Estimate the amount of money.
Explain how you estimated.
b) Count the money.
Show your work.
c) How can you show this amount using only coins?
Describe one way.

Practising

4. Show each amount in 3 ways.
a) 67¢ **b)** $3.00 **c)** $5.45 **d)** $10.00

5. Charlie traded a $10 bill for two $5 bills.
Describe two other ways he can trade his $10 bill.

6. Jose traded a $5 bill for coins. Which coins might he get? How do you know?
A. two $2 coins, one $1 coin
B. four $1 coins and 8 quarters
C. 3 loonies, 4 quarters, 10 dimes
D. 1 toonie, 4 loonies

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C Estimating and Counting Money

Guided Activity

Materials	• play money
Masters	• (manipulatives substitue) Play Money 1 and 2, Masters, Booklet, pp. 28–29

Assessment for Feedback	What You Will See Students Doing …	
Students will	**When Students Understand**	**If Students Misunderstand**
• estimate and count money amounts to $10 and record money amounts using money notation	• Students estimate, and then correctly count and record the value of a collection of up to $10 in bills and coins. Students use the ¢ sign and $ sign correctly.	• Some students may have difficulty counting and recording the amounts. Have them practise counting, recording, and then creating sets of money less than $1, then have them move on to amounts less than $2, and so on. Some students may require practice in drawing the ¢ and $ symbols.

1. Introduction (Whole Class) ▸ 5–10 min

Review coins and their values briefly with students by having them look again at page 42 of the Student Book. Have students review how to count quarters, dimes, and nickels by counting aloud by 25s, 10s, and 5s.

Introduce the $5 and $10 bills shown in Lesson 2C. Discuss how many coins students could trade for a $5 or $10 bill.

2. Teaching and Learning (Whole Class/Pairs) ▸ 15–20 min

Together read the central question and work through Sukan's Money. Have students use play money to role-play Sukan's counting. Make sure they are comfortable with counting the coins by 25s, 10s, and 5s. Ask students why Sukan estimated and then counted her money.

Have students complete prompts A to C in pairs and discuss their results with the class.

Reflecting Use these questions to ensure that students can count and trade coins and bills.

Sample Discourse

1. • *I didn't count nickels or pennies because even quite a few of these don't make another dollar. I checked the quarters though, because if I have 2 or more quarters and some more coins, that's probably close to another dollar.*
- *I didn't count coins smaller than a loonie, because I was just estimating.*

2. a) • *You could trade the $5 bill for 2 toonies and 1 loonie.*
- *You could trade the $5 bill for 5 loonies.*

b) • *You could trade 2 toonies and 1 loonie for a $5 bill.*
- *You could trade 1 toonie and 3 loonies for a $5 bill.*

3. Consolidation ▸ 25–30 min

Checking (Pairs)

3. Provide play money for students who want to use the bills and coins.

b) Encourage students to group their coins in $1 groups as they count.

Practising (Individual)

4. Provide play money for students who want to use the bills and coins.

6. Use Assessment Tools 7 and 9, Masters Booklet pp. 8 and 10, to assess answers for this key assessment question.

Closing (Whole Class)

Show students a handful of play money and ask them to estimate and count the amount.

Answers

A. For example, about $9; 2 toonies and 3 loonies are $2 + $2 + $1 + $1 + $1 = $7, and there are 4 quarters in a dollar, so 7 quarters is close to $2 more.

B. $9.04; for example, $7 and 25¢, 50¢, 75¢, 100¢, that makes $8; $8 and 25¢, 50¢, 75¢, 80¢, 85¢, 90¢, 95¢, 100¢, that's $9, and 4¢ more.

C. Juan has the most money; for example, because $9 is more than $8 and some cents.

1. & 2. See sample answers under Reflecting.

3. a) For example, about $8; $5 + $2 = $7 and 3 quarters and some more smaller coins is about one more dollar.

b) $8.15; for example, $7.00 and 25¢, 50¢, 75¢, 85¢, 95¢, 100¢, that's $8, plus 5¢, 10¢, 15¢.

c) For example, use 3 toonies and 1 loonie instead of a $5 bill and 1 toonie.

4. a) For example, 2 quarters, 1 dime, and 7 pennies; 6 dimes and 7 pennies; 2 quarters and 17 pennies

b) For example, 1 toonie and 1 loonie; 3 loonies; 30 dimes

c) For example, one $5 bill, 4 dimes, and 1 nickel; one $5 bill, 1 quarter, and 2 dimes; 5 loonies, 4 dimes, and 5 pennies

d) For example, one $10 bill; two $5 bills; 10 loonies

5. For example, for 10 loonies or 5 toonies

6. A, because $2 + $2 + $1 is $5, and C; for example, because because 4 quarters is a dollar, and 10 dimes is a dollar, plus $3 makes $5; not B, because 8 quarters is $2, plus $4 makes $6; not D, because 1 toonie and 4 loonies makes $6

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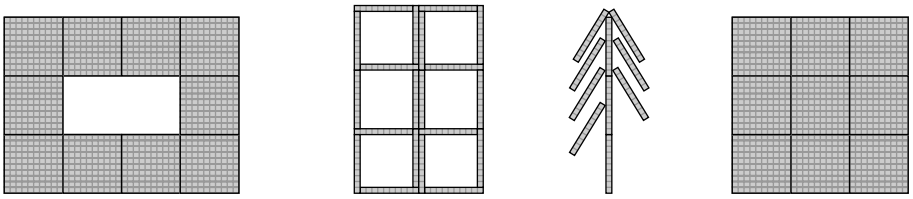
LESSON

Chapter Review

A

1. **a)** Which picture is worth 100?
b) Which picture is worth 1000?



A. **B.** **C.** **D.**

B

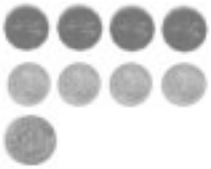
2. **a)** Start at 78 and count backward by 2s.
Write the 5th number.
Check with a calculator.
b) Start at 230 and count backward by 5s.
Write the 6th number.
Check with a calculator.
c) Start at 250 and count forward by 25s.
Write the 7th number.
Check with a calculator.

3. Juanita used a calculator.
She counted backward from 62 by 2s.
a) Predict the first 10 numbers on the calculator display.
b) Do you think the calculator display will show the number 7?
Explain why or why not. Check with a calculator.

C

4. Show the same amount of money with other bills or coins.

a)



b)

c)

d)

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Chapter Review Lessons A, B, and C

Using the Chapter Review

Use this supplemental review to assess students' understanding of the concepts developed in Lessons 2A, 2B, and 2C. All questions can be used for summative assessment.

Related Questions to Ask

Ask	Possible Response
About **Question 3b**): • Do you think the calculator display will show the number 3? Explain why or why not.	• *For example, no; when you count backward by 2s from 62, the ones digits have the pattern 0, 8, 6, 4, 2, repeat.*

Answers

1. a) C
b) A

2. a) 70; 78, 76, 74, 72, 70
b) 205; 230, 225, 220, 215, 210, 205
c) 425; 250, 275, 300, 325, 350, 400, 425

3. a) 62, 60, 58, 56, 54, 52, 50, 58, 56, 54
b) For example, no; when you count backward by 2s, the ones digits have the pattern 8, 6, 4, 2, 0, repeat, so 7 will never be displayed in the ones digit. It will never be displayed in the tens digit either, because 62 is less than 70.

4. a) For example, 1 quarter, 2 dimes, 4 pennies
b) For example, 2 loonies
c) For example, one $5 bill, 2 loonies, 1 quarter
d) For example, two $5 bills

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CHAPTER 3

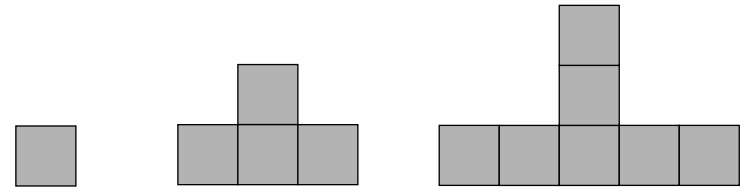
A Patterns in Graphs

You will need

- square tiles

- grid paper

Goal **Use a bar graph to represent a shape pattern.**



shape 1 shape 2 shape 3

? How can you use a bar graph to represent a shape pattern?

A. Continue the pattern. Make shape 4.

B. Complete a t-chart like this to show the number of tiles in each shape.

Shape Pattern

Shape number	Number of tiles
1	1
2	
3	
4	

C. Extend the t-chart to shape 5. Explain how you completed the chart.

D. Draw a bar graph to display the data. Use a scale of 2.

E. Draw another bar on the graph to represent shape 6.

F. Make another shape pattern. Use a bar graph to represent the pattern.

Reflecting

1. How does the graph show you that the pattern is a growing one?
2. Does the graph show you what the pattern looks like?

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A Patterns in Graphs

Exploration

Materials	• square tiles
Masters	• 1 cm Grid Paper, Masters Booklet p. 23

Assessment for Feedback	What You Will See Students Doing …	
Students will	**When Students Understand**	**If Students Misunderstand**
• use a bar graph to represent a growing pattern	• Students will use a t-chart to record the number of tiles in a growing pattern, and then use the data on the t-chart to construct a bar graph.	• Students may have difficulty representing data from a chart on a bar graph. Review the parts of each and use examples to show the correspondence between a chart and a graph.

1. Introduction

(Individual/Whole Class) ◗ 5–10 min

Provide students with square tiles and have each student create a growing pattern. Ask students to describe their patterns and state the pattern rule.

2. Teaching and Learning

(Whole Class/Pairs) ◗ 25–35 min

With students, read the central question and examine the shape pattern in Lesson 3A. Have students work through prompts A to C in pairs, and then discuss prompt C together. Students can continue working through prompts D to F in pairs. If necessary, review with students how to construct a bar graph. Discuss their responses as a class.

Reflecting Use these questions to ensure that students can represent a growing pattern using a bar graph.

Sample Discourse

1. • *Each bar is taller than the one before.*
- *The bars make a shape like a line going up.*

2. • *No, the graph just shows how many tiles are in each shape.*

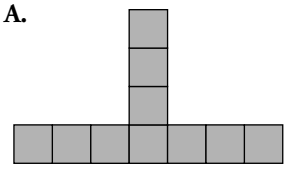
3. Consolidation ◗ 10–15 min

Use Assessment Tool 6, Masters Booklet p. 7, to assess answers for this lesson.

Closing (Whole Class)
Ask students to explain how they would construct a bar graph to represent the growing patterns they created during the Introduction to the lesson.

Answers

A.



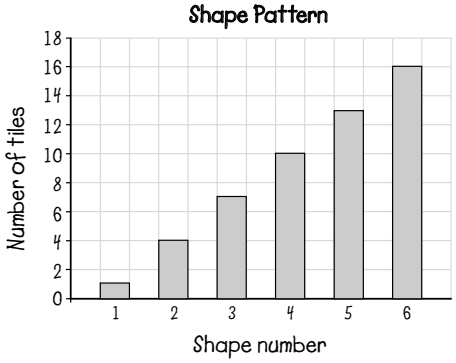
shape 4

B. & C.

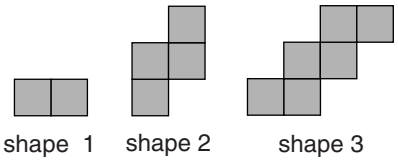
Shape number	Number of tiles
1	1
2	4
3	7
4	10
5	13

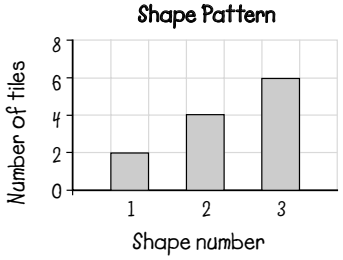
For example, each term is 3 greater than the one before, so I knew to add 3 to the number of tiles in shape 4 to get the number of tiles in shape 5.

D. & E.



F. For example,





1. & 2. See sample answers under Reflecting.

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CHAPTER 3

B Mode

Goal **Use the mode to describe a collection of data.**

Rose asked 10 friends how long they brush their teeth at bedtime.

Number of minutes brushing teeth									
1	2	2	1	3	2	1	3	2	2

? What brushing time is used by the most friends?

Rose's Solution

I'll look for the **mode** of the data.

First I'll write the data in order from least to greatest.

That will help me see which number occurs most often.

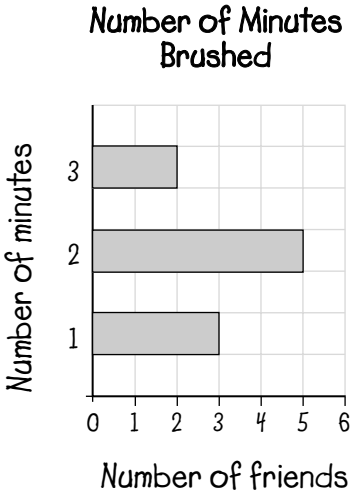
1 1 1 2 2 2 2 2 3 3

There are more 2s than any other number, so the mode is 2.

The brushing time used by the most friends is 2 minutes.

Brady's Solution

I'll display Rose's data in a bar graph.



The bar for 2 minutes is the longest.

So the mode of the data is 2 minutes.

The mode is the brushing time used most often.

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Reflecting

1. When might it be useful to know the mode of a collection of data?

2. **a)** If Rose's data had been these numbers instead, what do you think the mode of the data would be? Why?
   1 1 1 1 2 2 2 2 3 3

   b) If all Rose's friends brushed for different lengths of time, could she use the mode to describe her data? Explain.

mode
The number that occurs the most often in a set of numbers
3, 5, 2, 7, 2
The mode is 2.

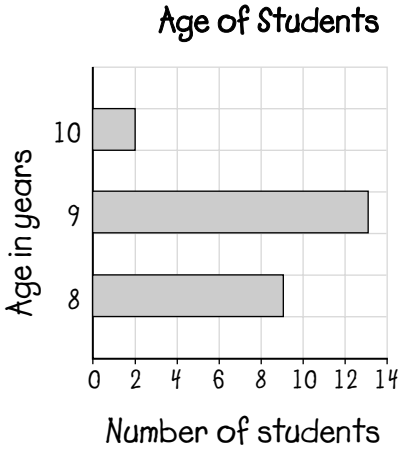
Checking

3. Tiffany asked some friends how many hours of television or movies they watched on the weekend. What is the mode of Tiffany's data? Show your work.

Number of hours of TV or movies watched
1 3 4 3 2 5 0 3 2 4

Practising

4. Gabe recorded the ages of students in the class. He made a graph of his data. What is the mode of Gabe's data?



5. What is the mode of the data?
   a) 4, 7, 5, 8, 7, 5, 6, 7, 4, 5, 7
   b) 2, 4, 3, 2, 3, 2, 1, 5, 3, 4, 3, 2
   c) 35, 37, 39, 36, 34, 33, 42
   d) 125, 240, 135, 125, 137

6. Ben and Lee each asked 5 friends how long they spend brushing their teeth.
   a) What is the mode for Ben's data?
   b) Can Lee use the mode to describe his data? Why or why not?

Number of minutes brushing teeth					
Ben's friends	2	2	1	3	1
Lee's friends	2	4	3	1	5

7. Flip a coin 10 times. Record the number of heads. Repeat this experiment 10 times. What is the mode of your data?

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B Mode

Direct Instruction

Assessment for Feedback	What You Will See Students Doing …	
Students will	**When Students Understand**	**If Students Misunderstand**
• identify the mode in a collection of data	• Students will identify the mode from a set of numbers.	• Students may not understand how to identify the mode. Discuss the possible strategies for counting the number of times that each number occurs. Students can order the set of numbers from least to greatest so that like numbers are together. They can use a tally chart to count the occurrences. Or, they can circle, highlight, or underline like numbers.

1. Introduction (Whole Class) ▸ 5–10 min

Conduct a simple class survey. For example, ask students to raise their hands if they are wearing a blue shirt, red shirt, green shirt, and so on. Record the results using a tally chart on the board. Ask students to describe the data. Conclude by asking which colour of shirt was worn by the most students that day.

2. Teaching and Learning (Whole Class/Pairs) ▸ 15–20 min

With students, read about Rose's survey and look at the data in her table. Together read the central question in Lesson 3B.

Work through Rose's Solution and Brady's Solution together. Draw attention to the highlighted definition for *mode*. Make sure that students understand how Rose and Brady determined the mode of the data.

Reflecting Use these questions to ensure that students understand how and why they would determine the mode of a collection of data. Question 2 will elicit a variety of responses; explain to students that there can be more than one mode or no mode in a collection of data.

Sample Discourse

1. • *When you want to know which is the most popular of something.*
- *When you want to know the thing that happens most often.*

2. a) • *I think the mode would be either 1 or 2, because there are four of each of them, and that's more than the two 3s.*
- *There are two modes, 1 and 2, because both numbers occur the most often.*
- *I don't know if you can have two modes. If you can, they both would be the mode, but if not, maybe there wouldn't be any mode.*

b) • *I don't think so, because no number would appear more often than another.*
- *No, the mode is the number that happens most often, and there wouldn't be any number that happens more than once.*

3. Consolidation ▸ 25–30 min

Checking (Pairs)

3. Suggest that students order the data from least to greatest.

Practising (Individual)

5. & 6. Remind students that there can be one mode, more than one mode, or no mode, depending on how often the same number appears.

6. Use Assessment Tools 7 and 9, Masters Booklet pp. 8 and 10, to assess answers for this key assessment question.

Closing (Whole Class)

Have students conduct another simple survey, similar to the shirt survey used in the Introduction, and have them determine the mode of the data they collect.

Answers

1. & 2. See sample answers under Reflecting.

3. 3; for example, 0, 1, 2, 2, 3, 3, 3, 4, 4, 5; 3 occurs the most often, so 3 is the mode.

4. 9 years

5. a) 7

b) 2 and 3

c) no mode

d) 125

6. a) 1 and 2

b) No; for example, there is no number that occurs more often than others.

7. For example,

Experiment	1	2	3	4	5	6	7	8	9	10
Times I rolled heads	6	4	7	5	4	5	6	6	8	4

The modes are 4 times and 6 times.

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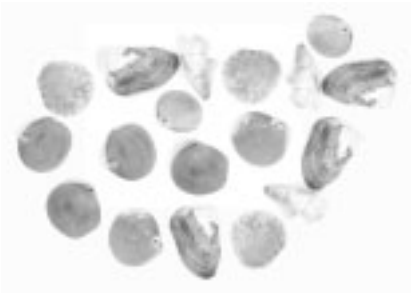
CHAPTER 4

A Exploring Mental Math Strategies

Goal **Use a variety of strategies to add and subtract 2-digit numbers mentally.**

Keisha had 57 seashells and Jack had 26.
Keisha gave 18 of her shells to Jack.



? How many shells do Keisha and Jack each have now?

Keisha's Strategy

I have 57 – 18 shells.

I can break up the numbers and add in my head.

I'll think of 18 as 17 and 1.

A. How can Keisha use 17 and 1 to calculate 57 – 18?

B. What other mental math strategies can you use to calculate 57 – 18?

C. How many shells does Keisha have left?

D. What mental math strategies can you use to calculate 26 + 18?

E. How many shells does Jack have now?

Reflecting

1. a) Compare your strategies for adding mentally. Which ways do you think are easiest? Why?

b) Compare your strategies for subtracting mentally. Which ways do you think are easiest? Why?

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A Exploring Mental Math Strategies

Exploration

Assessment for Feedback	What You Will See Students Doing …	
Students will	**When Students Understand**	**If Students Misunderstand**
• use a variety of mental strategies to add and subtract 2-digit numbers	• Students will select various mental math strategies to add or subtract 2-digit numbers.	• Students may tend to use only one strategy for all expressions. Remind them that one strategy might work better with a particular expression, while another strategy might work better with another expression. Encourage them to try various strategies before deciding which one they prefer.

1. Introduction (Whole Class) ▸ 5–10 min

Review with students some of the mental math strategies they used in Lesson 4.3. For example, to subtract 27 − 9, they can subtract 27 − 10, and then add back 1 to get the answer 18. Discuss with students which mental math strategies they like to use and why.

2. Teaching and Learning (Whole Class/Pairs/Individual) ▸ 25–35 min

Together read about Keisha and Jack's seashell problem and the central question in Lesson 4A. Work through Keisha's Strategy together, drawing attention to the mental math strategy that she used to subtract. Remind students that there are other strategies Keisha could have used. Have students complete prompts A to D in pairs, and then discuss their responses as a class. Students can complete prompt E individually.

Reflecting Use these questions to ensure that students are able to compare different mental math strategies and select one suitable for the expression they are trying to solve.

Sample Discourse

1. a) • *I think making tens is easiest, because tens are easy to add and it's easy to remember to take away what you added. Breaking up numbers means more new numbers to remember.*

• *I think adding the tens and then the ones is easiest, because you don't have any extra numbers to add on or take away.*

b) • *I like breaking up the numbers, because you can choose numbers that are easier to subtract.*

• *I think making tens is the easiest, because it makes the subtraction easy, and subtracting is harder than adding.*

3. Consolidation ▸ 10–15 min

Use Assessment Tool 6, Masters Booklet p. 7, to assess answers for this lesson.

Closing (Whole Class)
Provide students with an addition or subtraction expression, asking them to solve it using a mental math strategy and to explain why they chose that strategy.

Answers

A. For example, it is easy to subtract 57 − 17 mentally, and then you just have to subtract 1 from the answer to that.

B. For example, you could add 2 to 18 to make 20, then subtract 57 − 20 = 37, and then add back 2. You could also take 7 away from both 57 and 18, to get 50 − 11, which is the same as 50 − 10 − 1.

C. 39 shells

D. For example, you could add 2 to 18 to get 26 + 20 = 46, and then subtract 2 from 46; you could break up 18 into 4 + 14, then you have 26 + 4 + 14 = 30 + 14; or, you could add the tens and then the ones, like this: 20 + 10 = 30, 6 + 8 = 14, 30 + 14 = 44.

E. 44 shells

1. See sample answers under Reflecting.

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CHAPTER 4

B Finding Missing Numbers

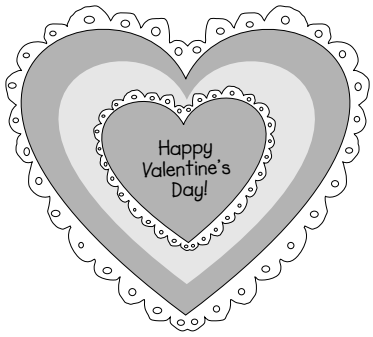
You will need

- counters

- base ten blocks

Goal **Determine missing numbers in addition and subtraction sentences.**

Some Grade 3 students are making valentines for their 25 classmates. So far, Charlie has made 13 valentines, Jessica has made 10, Sukan has made 17, and Devon has made 32.



? How many more valentines do Charlie, Jessica, and Sukan need, and how many extra does Devon have?

Charlie's Solution

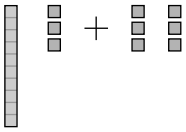
I've made 13 of the 25 valentines I need.

I can write a number sentence with a missing number for the valentines I still need to make.

$13 + \blacksquare = 25$

I can guess the missing number.
First I'll guess 6 for ■.

I'll test it using base ten blocks.



13 + 6 = 19. That's less than 25.

Next I'll try 10 for ■.

A. Guess the number that ■ represents in Charlie's number sentence. Test your guess.

B. Keep guessing and testing until you figure out ■. How many more valentines does Charlie need to make?

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C. How many more valentines does Jessica need to make? Use 10 + ■ = 25.

D. How many more valentines does Sukan need to make? Use 17 + ■ = 25.

E. How many extra valentines has Devon made? Use 32 − ■ = 25.

Reflecting

1. How are Charlie's, Jessica's, and Sukan's number sentences the same? How are they different?

2. How is Devon's number sentence different from Charlie's, Jessica's, and Sukan's? How is it the same?

Checking

3. Lyn, Brady, and Jack have each created a question for a survey of their 24 classmates. So far, Lyn has surveyed 15 classmates and Brady has surveyed 11. Jack's records show 33 classmates surveyed.

a) How many more students does Lyn need to survey? Use 15 + ■ = 24.

b) How many students must Jack have surveyed twice? Use 33 − ■ = 24.

Practising

4. Complete each number sentence.

a) 12 + ■ = 32 **c)** 18 + ■ = 29 **e)** 6 + ■ = 23

b) 34 − ■ = 26 **d)** 45 + ■ = 61 **f)** 47 − ■ = 38

5. Michael needs to collect 28 tin cans and Amit needs to collect 28 egg cartons for a science experiment.

a) Michael has collected 36 cans. How many extra cans has he collected? Use 36 − ■ = 28.

b) Amit has gathered 19 egg cartons. How many more does he need to collect? Use 19 + ■ = 28.

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B Finding Missing Numbers

Guided Activity

Materials	• counters, base ten blocks, (optional) play coins
Masters	• (manipulatives substitue) Base Ten Blocks: Ones, Masters booklet p. 35, Base Ten Blocks: Tens, Masters booklet p. 36

Assessment for Feedback	What You Will See Students Doing …	
Students will	**When Students Understand**	**If Students Misunderstand**
• determine the value of a missing number in an equation involving addition or subtraction	• Students will use guessing and checking to determine the missing numbers in addition or subtraction sentences.	• Students may solve equations incorrectly. Have them model the number sentence using base ten blocks.

1. Introduction (Whole Class) ▸ 5–10 min

Review with students how to write number sentences. Tell them you have 4 dimes and need enough dimes to make a loonie. Use play coins or ones blocks to represent the dimes, then ask students to write the number sentence that would determine the number of dimes you need to make a loonie ($4 + \square = 10$).

2. Teaching and Learning (Whole Class/Pairs) ▸ 15–20 min

Have students turn to Lesson 4B. Together read about the students and their valentines. Read the central question, and then work through Charlie's Solution together, making sure students understand how Charlie determined the number sentence for his problem. Students can complete prompts A and B in pairs, using base ten blocks for guessing and checking. Have them share their results with the class. They can continue working in pairs to complete prompts C to E.

Reflecting Use these questions to ensure that students understand how number sentences that have missing numbers can help them determine the missing numbers.

Sample Discourse

1. • *They are all addition sentences that equal 25.*
- *They all start with different numbers: 13, 10, and 17.*

2. • *Devon's number sentence is a subtraction sentence.*
- *Devon's subtraction equals 25, and the addition in Charlie's, Jessica's, and Sukan's number sentences equals 25.*

3. Consolidation ▸ 25–35 min

4. Use Assessment Tool 7 and 8, Masters Booklet pp. 8 and 9, to assess answers for this key assessment question.

Closing (Whole Class)
Provide students with pairs of related number sentences with missing numbers (for example, $10 + \square = 12$; $12 - \square = 10$) and ask students to determine the missing number.

Answers

A. For example, 10; 13 + 10 = 23, that's not enough.
B. 12 valentines
C. 15; 15 valentines
D. 8; 8 valentines
E. 7; 7 valentines
1. & 2. See sample answers under Reflecting.
3. a) 9 students
b) 9 students
4. a) 20 **b)** 8 **c)** 11 **d)** 16 **e)** 17 **f)** 9
5. a) 8 cans
b) 9 egg cartons

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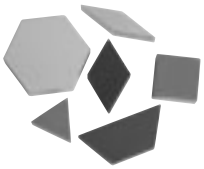
CHAPTER 7

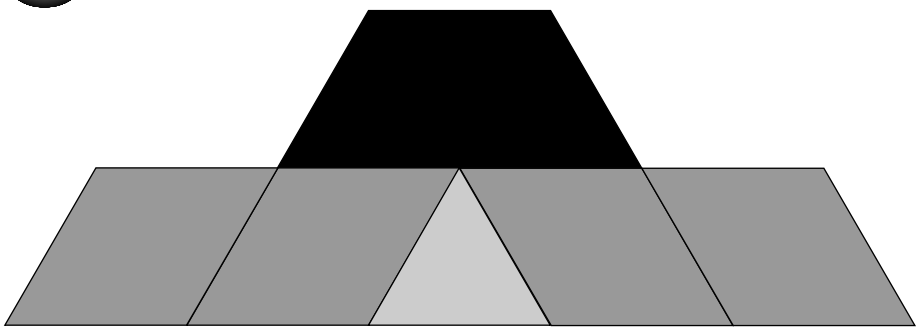
A Exploring Pattern Block Puzzles

You will need

- pattern blocks



Goal **Solve pattern block puzzles.**



Jack used 6 pattern blocks to make this shape.

? What are the greatest and least number of blocks you can use to make a pattern block shape?

A. Cover Jack's shape using only triangle pattern blocks.

B. What is the greatest number of blocks that can be used to cover Jack's shape?

C. Cover Jack's shape using the biggest pattern blocks you can.

D. What is the least number of blocks that can be used to cover Jack's shape?

E. Design a shape with pattern blocks. What are the greatest and least number of blocks you can use to make the same shape? Show your work.

Reflecting

1. How did you know when you had found the greatest number of blocks?

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A Exploring Pattern Block Puzzles

Exploration

Materials	• pattern blocks
Masters	• (manipulatives substitute) Pattern Blocks, Masters Booklet, pp. 40–45

Assessment for Feedback	What You Will See Students Doing …	
Students will	**When Students Understand**	**If Students Misunderstand**
• solve puzzles using shapes	• Students will determine the least or greatest number of pattern blocks required to create a puzzle shape.	• Students who have difficulty can lay the smaller pattern blocks directly on top of the larger pattern blocks to determine the greatest number of pattern blocks required to create a shape.

1. Introduction

(Individual/Whole Class) ◗ 5–10 min

Provide students with pattern blocks. After giving them some time to manipulate the blocks, prompt them to see which blocks they can use to completely cover other blocks. Discuss their findings as a class.

2. Teaching and Learning

(Individual/Whole Class/Pairs) ◗ 25–35 min

Together examine Jack's pattern block puzzle in Lesson 7A. Ask students to describe the puzzle. Read the central question and ask students to complete prompts A and B. Have them share their results, then complete prompts C to E. Students could create a display to share their pattern block shapes created for prompt E.

Reflecting Use these questions to ensure that students understand which pattern blocks can be used in place of other pattern blocks.

Sample Discourse

1. • *I looked carefully everywhere to see if any single block could be replaced by two or more blocks.*
- *I couldn't replace any blocks with smaller blocks.*

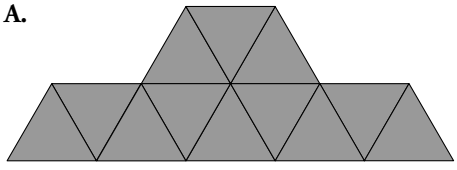
3. Consolidation ◗ 10–15 min

Use Assessment Tool 6, Masters Booklet p. 7, to assess answers for this lesson.

Closing (Whole Class)
Show students a pattern block shape and ask them the least and greatest number of pattern blocks needed to create the shape.

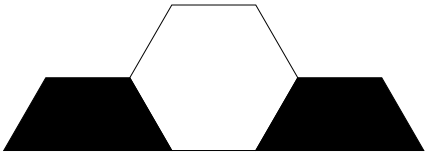
Answers

A.



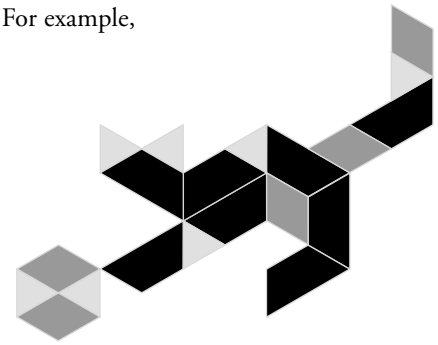
B. 12 blocks

C.

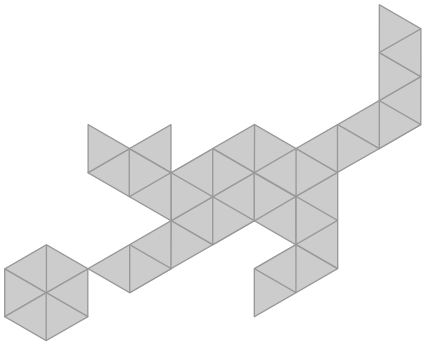


D. 3 blocks

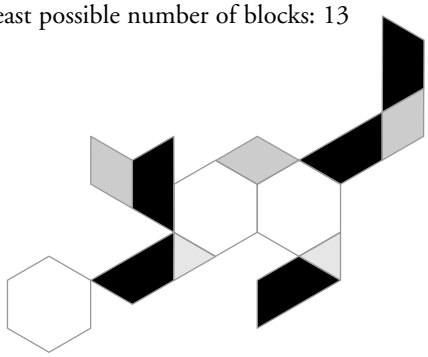
E. For example,



Greatest possible number of blocks: 41



Least possible number of blocks: 13



1. See sample answers under Reflecting.

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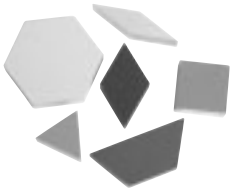
CHAPTER 7

B Classifying Angles

You will need

- pattern blocks



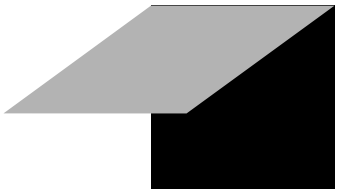
Goal **Describe angles by comparing them with right angles.**

The square pattern block has all **right angles**.

? What types of angles do pattern blocks have?

Gabe's Description

The beige pattern block has 2 angles greater than a right angle and 2 angles less than a right angle.



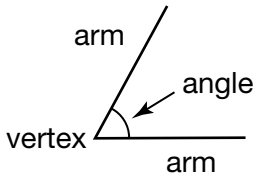
I'll compare the angles on the other blocks with the angles on the square.

A. Compare the angles on the other blocks with the angles on the square.
Record your findings in the chart.

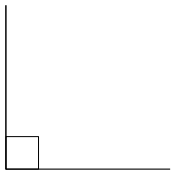
Pattern Block Angles

Pattern block	■	▰	▲	▱	▬	⬢
Number of right angles	4	0				
Number of angles less than right angles	0	2				
Number of angles greater than right angles	0	2				

angle
The space between 2 arms that meet at a vertex



right angle
An angle that is a square corner



The square near the vertex shows the angle is a right angle.

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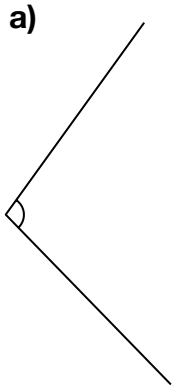
Reflecting

1. How can you tell just by looking that an angle is a right angle?
2. How did you decide if an angle was less than or greater than a right angle?

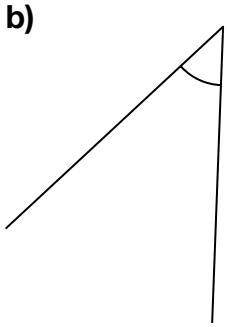
Checking

3. Describe each angle. Is it a right angle, less than a right angle, or greater than a right angle?

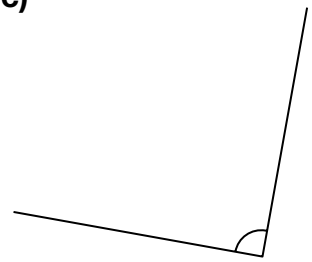
a)



b)



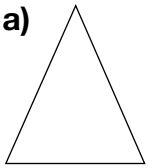
c)



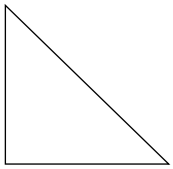
Practising

4. Describe the angles of each triangle. Use a square corner to check.

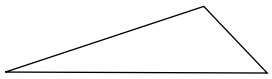
a)



b)



c)



5. Sketch and label the angle in each shape.

a) Sketch a 2-D shape with at least one angle that is a right angle.

b) Sketch a 2-D shape with at least one angle that is less than a right angle.

c) Sketch a 2-D shape with at least one angle that is greater than a right angle.

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B Classifying Angles

Guided Activity

Materials	• patterns blocks, (optional) square corners
Masters	• (manipulatives substitute) Pattern Blocks, Masters Booklet, pp. 40–45

Assessment for Feedback	What You Will See Students Doing …	
Students will	**When Students Understand**	**If Students Misunderstand**
• identify angles that are right angles, less than right angles, and greater than right angles	• Students will be able to identify right angles, less than right angles, and greater than right angles by visually estimating and by comparing with a square corner.	• Students may have difficulty classifying angles that are close to, but not exactly right angles. Guide these students as they carefully line up a square corner with one arm of an angle.

1. Introduction (Whole Class) ▸ 5–10 min

Introduce the word *angle* by focusing on corners of objects in the classroom. Emphasize the difference between an angle and a vertex. Explain that a vertex is the point at the corner of an angle, and an angle is the space between the sides that meet at a vertex. Ask students to point out the angle and the vertex on some corners.

2. Teaching and Learning (Whole Class) ▸ 15–20 min

Together read the introductory sentence and the central question in Lesson 7B. Draw attention to the highlighted definitions for *angle* and *right angle*. Guide students to identify examples of angles (right angle, less than right angle, greater than right angle) in classroom objects. Tell students that the symbol for angle looks like a small angle with one arm drawn horizontally, and that the small square corner in an angle means the angle is a right angle.

Work through Gabe's Description as a class, then have students complete prompt A.

Reflecting Use these questions to ensure that students can identify and compare right angles, angles that are less than right angles, and angles that are greater than right angles.

Sample Discourse

1. • *A right angle makes a square corner.*
- *One arm goes straight up from the other. It doesn't slant.*

2. • *I compared the angle with a right angle. If it fit inside the right angle, it was less than a right angle.*
- *I could usually tell just by looking if an angle was less than or greater than a right angle.*

3. Consolidation ▸ 25–30 min

Checking (Pairs)

3. Although some students may be able to determine visually whether an angle is right, greater than right, or less than right for this question, have all students use a square corner to compare or check.

Practising (Individual)

4. Encourage students to use math language (right angle, less than right angle, greater than right angle) when describing angles.

Use Assessment Tools 7 and 8, Masters Booklet pp. 8 and 9, to assess answers for this key assessment question.

Closing (Whole Class)

Tell students their elbow is a vertex and ask them to use their arm to display a right angle, a less than right angle, and a greater than right angle.

Answers

A.

Pattern Block Angles

Pattern block	■	▰	▲	▱	⏢	⯃
Number of right angles	4	0	0	0	0	0
Number of angles less than right angles	0	2	3	2	2	0
Number of angles greater than right angles	0	2	0	2	2	6

1. & 2. See sample answers under Reflecting.

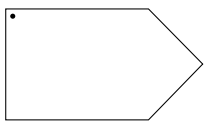
3. a) greater than **b)** less than **c)** right angle

4. a) All angles are less than a right angle.

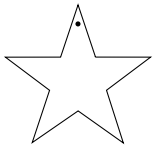
b) One angle is a right angle and two angles are less than a right angle.

c) One angle is greater than and two angles are less than a right angle.

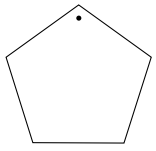
5. a) For example,



b) For example,



c) For example,



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C Polygons

You will need

- a ruler
- a square corner

Goal **Identify, compare, and relate polygons.**

Juan researched traffic signs on the Internet. He printed signs to make a bicycle safety poster. All the signs are 2-D shapes that are **polygons**.

Some names of polygons are triangle, **quadrilateral**, **pentagon**, **hexagon**, **heptagon**, and **octagon**.

? How can you describe the outside shapes of traffic signs?

A. Describe the shapes of these signs. Use the number of sides, side lengths, number of angles, and number of right angles. Name the polygons.
a) School Zone **b)** Yield **c)** Stop

polygon
A 2-D shape with sides that are straight lines

quadrilateral
A polygon with 4 sides

pentagon
A polygon with 5 sides

hexagon
A polygon with 6 sides

heptagon
A polygon with 7 sides

octagon
A polygon with 8 sides

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B. Is any sign on Juan's poster a hexagon or a heptagon? How do you know?

C. Rose sorted some of Juan's signs by the outside shape of the sign. She put the School Crosswalk, No Bicycles Allowed, and One Way signs in a group.

a) What **attribute** do you think Rose used for the group?

b) Which other signs belong in Rose's group? Explain why they belong.

c) Which signs do not belong in Rose's group? Explain why they do not belong.

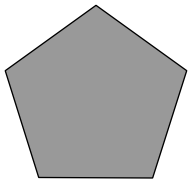
D. **a)** Make your own shape group with some of Juan's signs. Describe the attribute for your group.

b) Choose a sign in your group. Explain why it belongs.

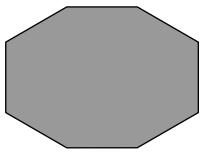
c) Choose a sign that does not belong in your group. Explain why it does not belong.

Reflecting

1. **a)** This shape and the School Zone sign are both pentagons.
How are the pentagons different?



b) This shape and a Stop sign are the same polygon. What is the polygon? Explain how you know.



2. How does knowing the names of polygons help you identify and compare polygons? Explain.

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C Polygons

Exploration

Materials	• rulers, square corners

Assessment for Feedback	What You Will See Students Doing …	
Students will	**When Students Understand**	**If Students Misunderstand**
• describe the shapes of traffic signs using geometric names and attributes	• Students will count the number of sides, vertices, and square corners of the polygons and name the shapes.	• Students may mistake colour as a geometric attribute. Review with them the definition of geometric attribute, such as number of sides, vertices, and square corners.

1. Introduction (Whole Class) ▸ 5–10 min

Ask student volunteers to each sketch a shape on a piece of paper, without revealing the shape. Have the other students ask questions about each shape until someone guesses the shape. Repeat the activity until several different polygons have been sketched and guessed.

2. Teaching and Learning (Whole Class/Pairs) ▸ 25–35 min

Ask students to turn to Lesson 7C. As a class, read about Juan's research on traffic signs and the central question. Have students examine the photograph and ask them to identify which polygon shapes they recognize, if any, in the traffic signs.

Work through each highlighted definition by reading it aloud and drawing the shape on the board or an overhead transparency. As students compare the shapes, encourage them to compare the angles and describe them as *bigger than*, *smaller than*, or *about the same* as other angles.

Work through prompts A to C, and then have students complete prompt D in pairs.

Reflecting Use these questions to ensure that students understand that polygons with the same name can look different because their side lengths or angles are different.

Sample Discourse

1. a) • *The School Zone sign has 2 right angles and the other pentagon has none.*
- *The School Zone sign has sides of different lengths, and the pentagon has all equal sides.*

b) • *They're both octagons, because they both have 8 sides.*

2. • *It is quicker to use a polygon name than to say the number of sides or angles, and everyone who knows the name will know right away what type of shape you mean.*
- *Sometimes polygons might not look like one another, but they are the same in some way, like the number of sides. The polygon names help you remember to think not just about how the shape looks.*

3. Consolidation ▸ 10–15 min

Use Assessment Tool 6, Masters Booklet p. 7, to assess answers for this lesson.

Closing (Whole Class)
Draw a shape on the board and ask students to identify which polygon you have drawn.

Answers

A. a) For example, the School Zone sign has 5 sides and 5 angles, with 2 right angles. The sides are not equal in length. It is a pentagon.

b) For example, the Yield sign has 3 sides and 3 angles, with no right angles. The sides are equal in length. It is a triangle.

c) For example, the Stop sign has 8 sides and 8 angles. Its sides are equal in length. The angles are all greater than a right angle. It is an octagon.

B. No. For example, a hexagon is a polygon with 6 sides and there is no sign with 6 sides. A heptagon is a polygon with 7 sides and there is no sign with 7 sides.

C. a) For example, I think Rose used number of sides as the attribute for the group.

b) Railway Crossing, Road Narrows, Pedestrian Crossover; for example, because they all have 4 sides.

c) For example, the School Zone sign because it has 5 sides; the Stop sign because it has 8 sides; the Yield sign because it has 3 sides.

D. a) For example, my shape group can be the School Zone sign and the Yield sign. The attribute is an odd number of sides.

b) For example, the Yield sign belongs because it has 3 sides and 3 is an odd number.

c) For example, the Stop sign does not belong because it has 8 sides and 8 is not an odd number.

1. & 2. See sample answers under Reflecting.

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CHAPTER 7

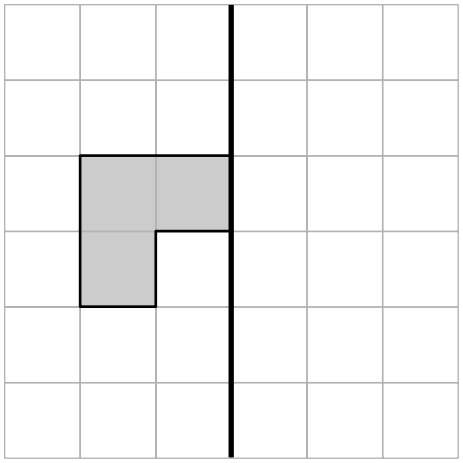
D Drawing Designs with Symmetry

You will need

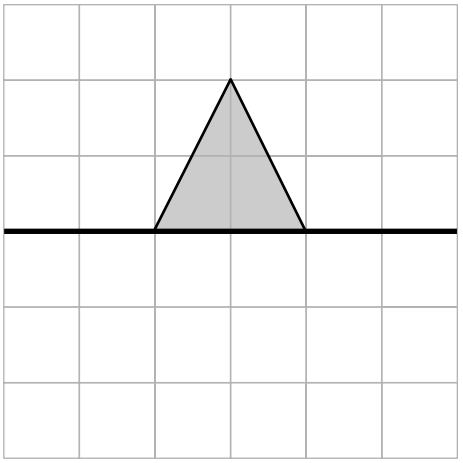
- a transparent mirror

Goal **Complete and describe symmetrical shapes.**

Lyn and Amit are creating symmetrical shapes. They drew a design on one side of a **line of symmetry**.



Lyn's design



Amit's design

? How can you complete and describe their designs?

A. Place a transparent mirror along the line of symmetry of Lyn's design to see what the completed shape will look like.

B. Draw the other half of the shape.

C. Describe the completed shape.

D. Repeat parts A to C for Amit's design.

Reflecting

1. How do you know the designs are symmetrical? Explain.

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D Drawing Designs with Symmetry

Exploration

Materials	• transparent mirrors, (optional) pattern blocks

Assessment for Feedback	What You Will See Students Doing …	
Students will	**When Students Understand**	**If Students Misunderstand**
• draw and describe images that have a line of symmetry	• Students will draw and describe symmetrical designs along a vertical, horizontal, or diagonal line of symmetry.	• Students may only be comfortable using folding and tracing to draw a symmetrical design. Guide them in using the transparent mirror to see the symmetrical design.

1. Introduction (Whole Class) ▸ 5–10 min

Review with students how to use a transparent mirror to find lines of symmetry. Have them practise on pattern blocks and classroom objects.

2. Teaching and Learning (Whole Class/Pairs) ▸ 25–35 min

Show students a pattern block and ask how they could use a congruent pattern block to make a symmetrical design. Elicit from students that they must first choose one side of the pattern block to be a line of symmetry.

Ask students to turn to Lesson 7D. Read about Lyn's and Amit's symmetrical designs and the central question. Students can work through prompts A to D in pairs, taking turns to describe the shapes.

Reflecting Use this question to ensure that students can recognize and describe a symmetrical design.

Sample Discourse

1. • *If I folded the shape on the line of symmetry, both halves would match exactly.*
- *When I look at the shape using the transparent mirror, the mirror image is exactly on the design I drew.*

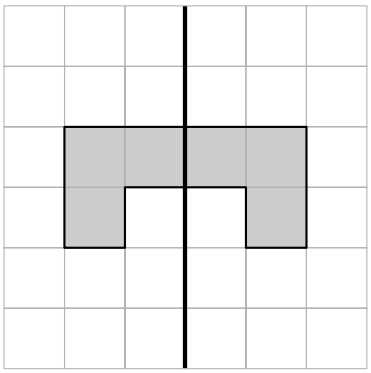
3. Consolidation ▸ 10–15 min

Use Assessment Tool 6, Masters Booklet p. 7, to assess answers for this lesson.

Closing (Whole Class)
Ask students to describe how they know a design is symmetrical. As an extension, students might enjoy creating their own symmetrical designs. Have one student create half of a design with a line of symmetry and challenge a classmate to complete the design. Designs could be drawn with or without grid paper.

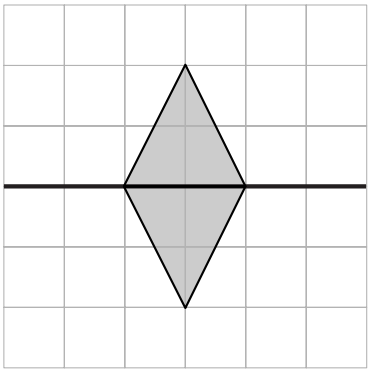
Answers

B.



C. For example, the shape looks like a table.

D.



For example, it is a diamond shape.

1. See sample answers under Reflecting.

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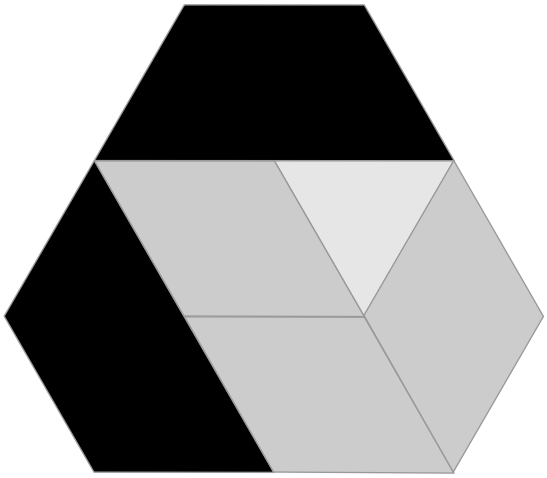
Chapter Review

LESSON

A

1. **a)** What is the least number of pattern blocks needed to make this shape? Model your solution with blocks.

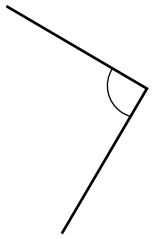
b) What is the greatest number of pattern blocks that could be used? Explain.



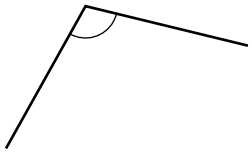
B

2. Is each angle a right angle, less than a right angle, or greater than a right angle?

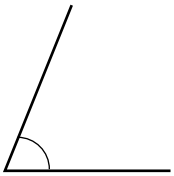
a)



b)



c)



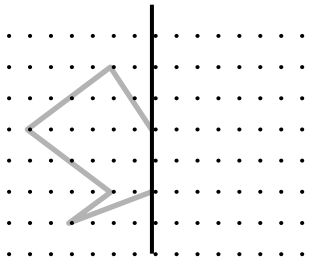
C

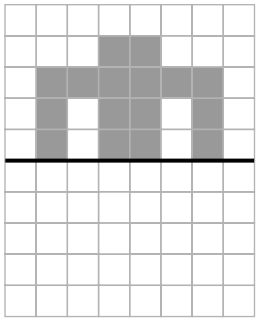
3. Match the polygon with the number of sides.

a) triangle	**A.** 4 sides
b) hexagon	**B.** 3 sides
c) quadrilateral	**C.** 7 sides
d) octagon	**D.** 6 sides
e) pentagon	**E.** 8 sides
f) heptagon	**F.** 5 sides

D

4. Complete each symmetrical design.





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Chapter Review Lessons A, B, C, and D

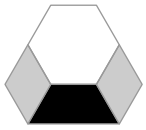
Using the Chapter Review

Use this supplemental review to assess students' understanding of the concepts developed in Lessons 7A, 7B, 7C, and 7D. All questions can be used for summative assessment.

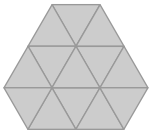
Ask	Possible Response
About **Question 3b**): • How do you know your design is symmetrical?	• *If I folded the design along the line of symmetry, the two sides would match.*

Answers

1. a) 4 blocks



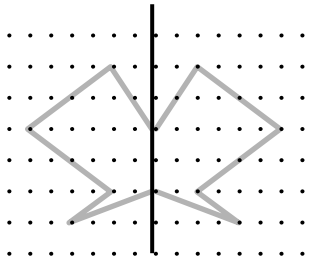
b) 13 blocks, for example, I can replace each trapezoid and rhombus pattern block with triangle pattern blocks.



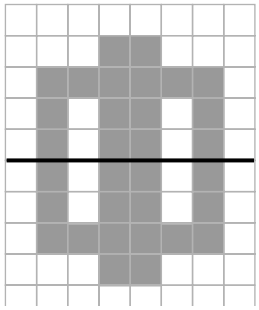
2. a) right angle
b) greater than
c) less than

3. a) B
b) D
c) A
d) E
e) F
f) C

4. a)



b)



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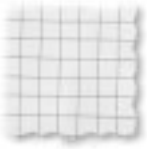
CHAPTER 8

A Measuring Area with Grid Paper

You will need

- 1 cm grid paper

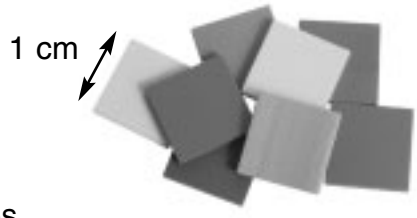


- 2 cm grid paper

Goal **Measure an area using different sizes of square units and compare the measurements.**

Keisha and Gabe made 10 cm square coasters with ceramic tiles. Gabe used larger tiles than Keisha.

Gabe's tiles



Keisha's tiles

? How can you describe the area of Gabe's and Keisha's coasters?

A. Draw Gabe's coaster on 2 cm grid paper. What is the area of the coaster in square units?

B. Draw Keisha's coaster on 1 cm grid paper. What is the area of the coaster in square units?

Reflecting

1. How do you know that Gabe's and Keisha's coasters are the same size?
2. Compare the number of square units in Gabe's and Keisha's coasters. Why are the measurements different?

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A Measuring Area with Grid Paper

Exploration

Masters	• 1 cm Grid Paper, Masters Booklet p. 23 • 2 cm Grid Paper, Masters Booklet p. 24

Assessment for Feedback	What You Will See Students Doing…	
Students will	**When Students Understand**	**If Students Misunderstand**
• measure and record area using grid paper	• Students will correctly measure area using different sizes of grid paper and be able to compare areas.	• Students may not understand that the two coasters are the same size even though the number of square units is different. Have them cut out the coasters they drew on grid paper and compare them.

1. Introduction (Whole Class) ▸ 5–10 min

Show students a square piece of paper divided into four equal parts. Ask students how many square units the paper measures (*4*). Divide each square unit into four equal parts and ask students how many square units the paper now measures (*16*). Ask students if the area of the piece of paper has changed (*no*).

2. Teaching and Learning (Whole Class/Pairs) ▸ 25–30 min

Together read about Keisha and Gabe in Lesson 8A, and then read the central question. Make sure students understand that both coasters are 10 cm long and 10 cm wide. Provide 1 cm and 2 cm grid paper and have students complete prompts A and B in pairs.

Reflecting Use these questions to discuss students' findings. Make sure students understand that the size of the square units determines the number of units in the area.

Sample Discourse

1. • *They are both 10 cm squares so they both cover the same amount of space.*
- *I put one on top of the other and they match so they're the same area.*

2. • *They used different sizes of squares to measure.*

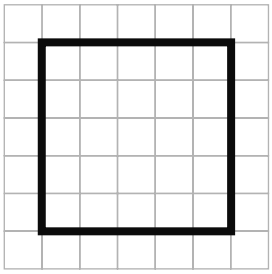
3. Consolidation ▸ 10–20 min

For students who seem ready, explain that the smaller grid paper is based on the standard 1 cm unit for length. The sides of each grid square is 1 cm, so the unit for area is called a square centimetre.

Closing (Whole Class)
Have students draw a shape on 1 cm grid paper, then draw a congruent shape on 2 cm grid paper, and then compare the number of square units in each. Encourage them to draw shapes other than squares. Use Assessment Tool 6, Masters Booklet, p. 7, to assess answers for this whole exploration. For students using 1 cm grid paper, ask them to express the measures of area in square centimetres.

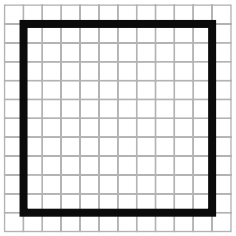
Answers

A.



25 square units

B.



100 square units (or 100 square centimetres)

1.–2. See sample answers under Reflecting.

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CHAPTER 9

A Multiplying by 0 and 1

You will need

- counters

Goal **Explore multiplication by 0 and 1.**

Rose and her friends bought hockey cards.

- Charlie bought 3 packs.
- Rose bought 1 pack.
- Gabe bought 2 packs.
- Juan bought 0 packs.

Each pack had 3 cards.

? How can you use multiplication to show the number of cards each student bought?

Rose's Model

I'll use counters to model my cards.

1 group of 3 is 3. $1 \times 3 = 3$

A. Model Charlie's and Gabe's cards. Sketch your models. Write related multiplication sentences.

B. How can you model Juan's cards? Write a multiplication sentence to show the number of cards in 0 packs of 3 cards.

Reflecting

1. Look at the multiplication sentences for Rose's, Gabe's, and Charlie's cards. What do you notice?

2. Suppose each pack had 5 cards, but Juan still had 0 packs. How would your multiplication sentence for Juan's cards change?

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A Multiplying by 0 and 1

Exploration

Materials	• counters

Assessment for Feedback	What You Will See Students Doing…	
Students will	**When Students Understand**	**If Students Misunderstand**
• identify the properties of zero and one in multiplication	• Students will understand that any number multiplied by 0 is 0 and any number multiplied by 1 is the number.	• Students may have difficulty understanding that any number multiplied by 0 is 0. Model the properties using groups of students. Ask, "How many students is 1 group of 5 students?" Have 1 group of 5 students stand. Then ask, "How many students is 0 groups of 5 students?" Ask how many students should stand. Repeat several times with various numbers.

1. Introduction (Whole Class) ▸ 5–10 min

Ask students to count by ones. Then ask them to count by zeros. Talk about why they have difficulty doing this. Make sure they understand that 0 represents nothing, and "nothing" cannot be counted.

2. Teaching and Learning (Whole Class/Pairs) ▸ 25–30 min

Ask students to turn to Lesson 9A. Together read about the hockey card problem, and then read the central question. Use counters on an overhead projector to model the problem as you work through Rose's Model as a class.

Students can complete prompts A and B in pairs. Discuss their results as a class.

Reflecting Use these questions to ensure that students understand that any number multiplied by 0 is 0 and any number multiplied by 1 is the number itself.

Sample Discourse

1. • *All of them are a number multiplied by 3, as in [ ] × 3 = [ ].*
- *One factor in the multiplication sentence stays the same (3). The other factor goes up by 1 each time. The product goes up by 3 each time.*

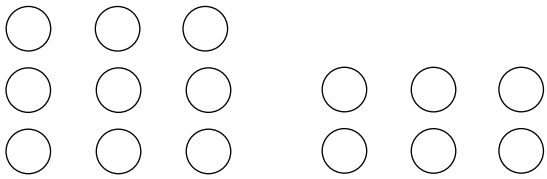
2. • *The multiplication sentence would be 0 × 5 = 0 instead of 0 × 3 = 0*
- *You would multiply 0 by a different number but the answer would still be 0.*

3. Consolidation ▸ 10–20 min

Closing (Whole Class) Ask students to solve various multiplication problems (e.g., 1 × 4, 0 × 8, 1 × 2, 0 × 2, 0 × 3) and to explain how they solved the problems. Ask students to say what happens when they multiply a number by 1, and when they multiply a number by 0. Use Assessment Tool 6, Masters Booklet, p. 7, to assess answers for this whole exploration.

Answers

A.



Charlie: 3 × 3 = 9 Gabe: 2 × 3 = 6

B. For example, Juan didn't buy any packs, so there is nothing to model. 0 × 3 = 0.

1.–2. See sample answers under Reflecting.

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CHAPTER 11

A Estimating and Measuring Capacity

You will need

- water
- a 1 L measuring cup

- empty containers of different sizes

Goal **Estimate, measure, and compare capacities in litres.**

Gabe and his sister are making vegetable soup.
The recipe calls for one **litre** (1 **L**) of water.

? How can you find containers that hold about 1 L?

Gabe's Plan

The measuring cup has a **capacity** of 1 L.

I'll compare this with other containers to estimate whether they hold about a litre.

Then I'll measure to check.

I'll record my measurements in litres or parts of litres.

litre (L)
A unit of measurement for capacity

capacity
The amount a container can hold

A. Compare the 1 L measuring cup with your containers.
Estimate the capacity of each container.
Is it less than 1 L, about 1 L, or more than 1 L?
Record your estimates.

	Capacity	
Container	**My estimate**	**Measurement**

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B. Measure with water and the 1 L measuring cup to check your estimates. Record your measurements as accurately as you can by using litres and halves and quarters of litres.

Reflecting

1. Why does 1 L of water go to different heights in different containers?
2. What items do you already know hold about 1 L?
3. Why do you think Gabe's recipe calls for 1 L of water instead of 1 bowl of water?

Checking

4. **a)** Choose 2 containers that you estimate have a capacity greater than 2 L.
   Pour water into each container.
   Stop pouring when you think you have poured about 2 L.
   b) Check by measuring the water you poured.

Practising

5. **a)** Choose 3 large containers. Estimate the capacity of each in litres. Record your estimates in a chart.

	Capacity	
Container	**My estimate**	**Measurement**

   b) Measure the capacity of each in litres or part litres.
   c) Order the containers from least to greatest capacity.

6. **a)** Pour exactly 1 L of water into a large container. Estimate the capacity of the container in litres.
   b) Measure to check your estimate.

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A Estimating and Measuring Capacity

Guided Activity

Materials	• water • 1 L measuring cups • large containers with different capacities • smaller containers for pouring

Assessment for Feedback	What You Will See Students Doing…	
Students will	**When Students Understand**	**If Students Misunderstand**
• estimate, measure, and compare the capacity of containers	• Students will be able to use a 1 L measure to guide their estimation and accurately sort the containers by capacity.	• Students may sort the containers at random because they have no basis for estimation. Have them measure 1 L of water and pour it into one of the containers. They can compare this with the other containers to estimate.

1. Introduction (Whole Class) ▸ 5–10 min

Display a variety of containers, such as spoons, cups, mugs, jugs, pitchers, and pots. Hold up two containers with very different capacities, such as a spoon and a large pot. Discuss with students whether they can tell if one container would hold more water than the other, and how they know.

2. Teaching and Learning (Whole Class/Pairs) ▸ 15–20 min

Ask students to turn to Lesson 11A. Together read about Gabe and his sister's vegetable soup and draw attention to the highlighted definitions for *litre (L)* and *capacity*. Read the central question, then work together through Gabe's Plan. Students can complete prompts A and B in small groups, then share their results with the class.

Reflecting Use these questions to ensure that students understand the importance of using a standard unit of measurement.

Sample Discourse

1. • *When a container is wider, it holds more water at the bottom so the water goes to a lower height.*
- *In a taller container, the water goes to a higher height because the bottom is narrower and doesn't hold as much water.*

2. • *A 1 L milk carton*
- *A 1 L pop bottle*

3. • *There are many different sizes of bowls and you might use too much or too little water depending on which bowl you use.*
- *Telling people to use 1 L is easier because 1 L is the same no matter what measuring cup you use.*

3. Consolidation ▸ 20–30 min

Checking (Pairs)

4. Students should not use a 1 L measuring cup for pouring in part (a), though they may need to have the 1 L measuring cup handy to help them estimate and to check in part (b).

Practising (Individual)

5. Students might need some assistance in the transition from measuring 1 L and 2 L to estimating the capacity of containers in litres. Prompt them to think about where the 1 L and 2 L marks would be on each container, and then have them add additional litres, one at a time, until the container is full, marking the level each time.

Use Assessment Tools 7 and 8, Masters Booklet pp. 8 and 9, to assess answers for this key assessment question.

Closing (Whole Class) Ask students what capacity of container they use most often.

Answers

A. & B. For example,

	Capacity	
Container	**My estimate**	**Measurement**
pot	more than 1 L	1 L and a half
jar	about 1 L	1 L and a quarter
can	less than 1 L	half of 1 L

1.–3. See sample answers under Reflecting.

4. a)–b) For example, I poured almost 3 L into the first container, and about 2 L into the other container.

5. a)–b)

	Capacity	
Container	**My estimate**	**Measurement**
jug	about 4 L	between 4 and 5 L
pot	about 3 L	3 L and a half
pail	about 5 L	about 7 L

c) For example, pot, jug, pail

6. a) For example, about 6 L

b) For example, 4 L and a half

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CHAPTER 11

B Estimating and Measuring Mass

You will need

- balance scales and masses

- various objects to measure

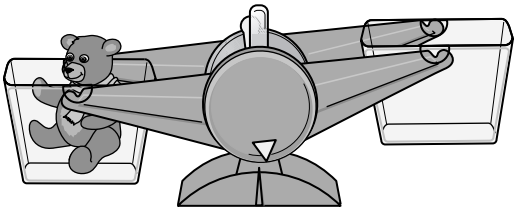
Goal **Estimate, measure, and compare the masses of objects.**

Brady's guinea pig has a **mass** of one **kilogram** (1 **kg**).
So does Keisha's kitten.

? How can you find objects with a mass of about 1 kg?

Michael's Measuring Tools

I can use balance scales to measure the mass of this teddy.



First I'll hold the **1 kg mass** to see how heavy it feels.

Then I'll estimate the mass of the teddy.

I'll measure to check.

I'll record the measurement using kilograms or part kilograms.

mass
The amount of matter in an object

kilogram (kg)
A unit of measurement for mass

1 kg mass
An object with a mass of 1 kg, used to measure mass

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A. Hold a 1 kg mass in one hand. Hold another object in your other hand. Estimate the mass of the object. Is it less than 1 kg, about 1 kg, or greater than 1 kg? Record your estimate.

	Mass	
Object	**My estimate**	**Measurement**

B. Measure with balance scales and masses to check your estimate. Record your measurements as accurately as you can by using kilograms and halves and quarters of kilograms.

C. Continue estimating and measuring with your other objects.

D. Order the objects from least to greatest mass.

Reflecting

1. How can you use the mass of one object to estimate the mass of another object?

2. a) Can thinking about the size of an object help you estimate its mass? Explain.

b) Can thinking about the material an object is made of help you estimate its mass? Explain.

Checking

3. a) Make a stack of books that you estimate has a total mass of about 1 kg. Measure to check. Was your estimate close?

b) Make a stack of different books that you estimate has a total mass of about 3 kg. Measure to check. Was your estimate close?

Practising

4. Estimate the masses.

5. Find 3 more objects to measure. Record your estimates and measurements in a chart like the one in Part A. Use kilograms and part kilograms.

	Mass		
Object	Less than 1 kg	About 1 kg	More than 1 kg
10 loonies			
bicycle			
basketball			

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B Estimating and Measuring Mass

Guided Activity

Materials	• balance scales and 1 kg , 500 g, and 250 g masses • various objects to measure

Assessment for Feedback	What You Will See Students Doing…	
Students will	**When Students Understand**	**If Students Misunderstand**
• estimate the masses of a variety of objects	• Students will be able to make reasonable estimates, using kilograms, of various-sized objects.	• Have students who have difficulty making reasonable estimates place a 1 kg mass in one hand and the object they are estimating in the other. Encourage them to compare the object with the mass, stating whether they think it is less than, greater than, or about 1 kg.

1. Introduction (Whole Class) ▸ 5–10 min

Show students a 1 kg mass and balance scales. Place an object with a mass of about 1 kg (e.g., a book) on one side of the scales and the 1 kg mass on the other side. Demonstrate how to use the scales to determine whether the book is greater than, less than, or about 1 kg.

2. Teaching and Learning (Whole Class/Pairs) ▸ 15–20 min

Have students turn to Lesson 11B. Draw attention to the highlighted definitions for *mass*, *kilogram* (*kg*), and *1 kg mass,* relating them to the balance scales and 1 kg mass you showed students in the Introduction. Together read the problem and the central question. Work through Michael's Measuring Tools, relating Michael's measurement to the demonstration you gave students of how to use the balance scales. Have students use 1 kg, half kilogram, and quarter kilogram masses to get closer measurements.

Students can work through prompts A to D in pairs. Discuss their results.

Reflecting Students discuss how they can compare objects to determine the mass of another object.

Sample Discourse

1. • *If you know the mass of one object, you can compare its mass to the mass of another object.*

2. a) • *Big objects often have a big mass too, but some small things, like the masses for the scale, have a greater mass than something bigger, like a balloon.*

• *Something very small, like a raisin, often has a smaller mass than something much bigger, like an apple.*

b) • *Yes, because some materials have a lot of mass, like metals, and others have less mass, like foam rubber.*

• *Sometimes; for example, a bottle of water has more mass than a bottle of air, but often objects look like they will have a greater mass and then you are surprised when you measure them to find out they don't.*

3. Consolidation ▸ 20–30 min

Checking (Pairs)

3. Students who are having difficulty making reasonable estimates can compare a single book to a 1 kg mass before they estimate whether a stack of books has a mass of about 1 kg.

Practising (Individual)

4. & 5. Use Assessment Tools 7 and 8, Masters Booklet pp. 8 and 9, to assess answers for these key assessment questions.

Closing (Whole Class) Ask students how they can determine the approximate mass of an object if they don't have balance scales.

Answers

A.–C. For example,

	Mass	
Object	**My estimate**	**Measurement**
3-hole punch	about 1 kg	less than 1 kg
water bottle	about 1 kg	about 1 kg
globe	about 1 kg	1 kg and a quarter

D. For example, from least to greatest: 3-hole punch, water bottle, globe

1. & 2. See sample answers under Reflecting.

3. a) For example, yes, the stack had a mass of about 1 kg.

b) For example, no, the stack was a lot more than 3 kg.

4.

	Mass		
Object	Less than 1 kg	About 1 kg	More than 1 kg
10 loonies	✔		
bicycle			✔
basketball		✔	

5. For example,

	Mass	
Object	**My estimate**	**Measurement**
stapler	less than 1 kg	about a quarter of 1 kg
pair of shoes	about 1 kg	half of 1 kg
math book	about 1 kg	about 1 kg

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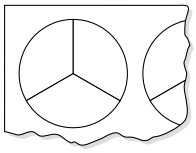
You will need

- fraction mats



- pencil crayons

Getting Started

Common Fractions

? What things do you see that show halves, thirds, or fourths?

A. What fractions do the plates of food show?

B. What fractions does the pie show?

C. What fractions do the drinks show?

D. Describe the fraction parts in each picture on the wall.

E. Find something that shows halves that are not rectangles or triangles.

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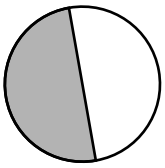
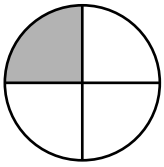
Do You Remember?

1. What fraction name goes with each picture?

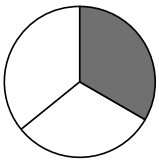
a)



b)

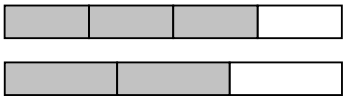


c)



one fourth
one half
one third

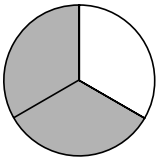
2. a) Name the two fractions shaded below.



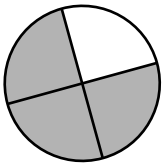
b) Compare the two fractions. Which is greater?

3. Order the fractions from least to greatest.

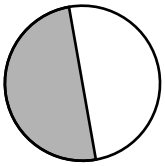
A.



B.



C.



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Getting Started
Common Fractions
Initial Assessment

Materials	• pencil crayons
Masters	• Fraction Mats, Masters Booklet, p. 59

Use these pages as an opportunity for initial assessment and to give you a sense of students' understanding of fractions from Grade 2. Observe what students can do and what they're having difficulty with. Record your notes using the Initial Assessment Summary for each individual.

Using the Activity (Whole Class) ▸ 30–40 min

Ask students to examine the picture in this supplemental Getting Started, and have them make a list of the items they see that show fractions. Distribute copies of **Fraction Mats p. 59** to students. Take time to compare the fraction mats to the plates on the table. Then guide students through prompts A to E.

Prompt C Students may look at the three division lines on each glass and say each glass is divided into three parts. Assist them by drawing the glass on the board and colouring each section a different colour.

Using Do You Remember?
(Individual) ▸ 10–20 min

1. Encourage students to describe each picture in words before determining the fraction.
2. Some students may name the fractions as one fourth and one third instead of three fourths and two thirds. This answer is not wrong, but throughout the chapter, shading is used to represent the fraction under consideration.
4. Students can visually determine which fraction is greater without naming the faction, but encourage them to use words to describe the fractions.

Answers

A. one third, one third, two thirds
B. three fourths left and one fourth gone
C. one fourth, three fourths, one whole or four fourths, two fourths, or one half
D. halves, thirds, halves
E. for example, the boy's shirt
1. **a)** one half **b)** one fourth **c)** one third
2. **a)** three fourths, two thirds
b) three fourths
3. C, A, B

Initial Assessment	What You Will See Students Doing…	
Common Fractions	**When Students Have an Area of Strength**	**When Students Have an Area of Need**
• Prompts A to F (Knowledge and Understanding)	• Students will identify halves, thirds, and fourths from pictures as a part of a whole.	• Students may more easily recognize unit fractions (one third or one fourth, but not two thirds or three fourths), or they may have difficulty recognizing fractions at the pictorial level. Provide students with real objects that are divided into equal parts.
Do You Remember?	**When Students Have an Area of Strength**	**When Students Have an Area of Need**
• Question 1 (Knowledge and Understanding)	• Students recognize pictorial representations of fractions.	• Ask students to describe the shaded portion of each circle in their own words.
• Questions 2 and 3 (Knowledge and Understanding)	• Students can compare fractions using pictorial models.	• Encourage students to trace one picture and place it over the other for direct comparison.

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CHAPTER 12

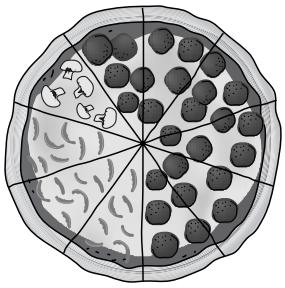
A Fractions as Parts of a Whole

You will need

- pencil crayons

Goal **Use fractions to describe parts of a whole.**

? What fractions can describe the parts of a pizza?



Jack's Pizza

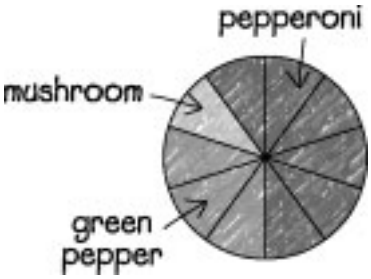
I'll model the pizza toppings using a fraction mat.

There are 10 equal slices.

I like the pepperoni part of the pizza.

That's 6 out of 10 slices, or six tenths.

Only four tenths of the pizza is left.



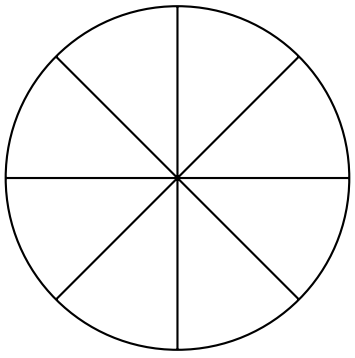
A. Brady ate the part of the pizza with green peppers. What fraction of the whole pizza did she eat?

B. Lee ate the part of the pizza with mushrooms. What fraction of the whole pizza did he eat?

C. What fraction of the pizza is left after all 3 children eat?

D. What fraction of the pizza did all 3 children eat?

E. Model your own pizza with 8 slices. Cover different slices with different toppings. Use fractions to describe your pizza.



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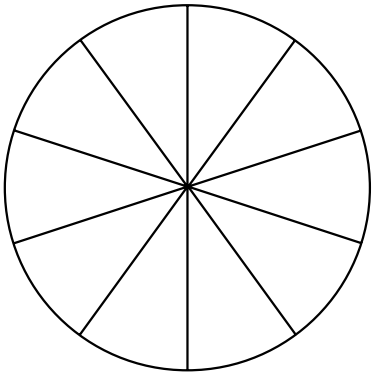
Reflecting

1. Jack used two words to describe a fraction, for example, *six tenths*.
- **a)** What does the second word in a fraction tell you?
- **b)** What does the first word tell you?

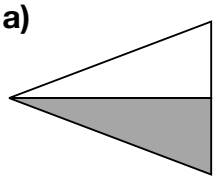
Checking

2. **a)** Colour the fraction mat so that seven tenths of the pizza is covered with pineapple.
- **b)** How many slices does this pizza have?
- **c)** What do you know about three tenths of the pizza?

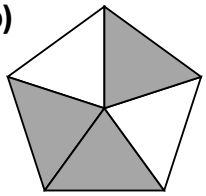


3. What fraction is shaded?

a)



b)

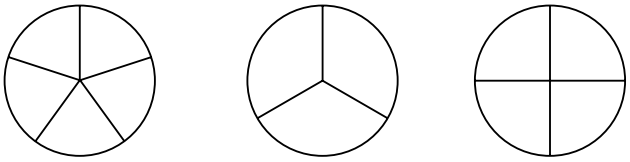


c)

Practising

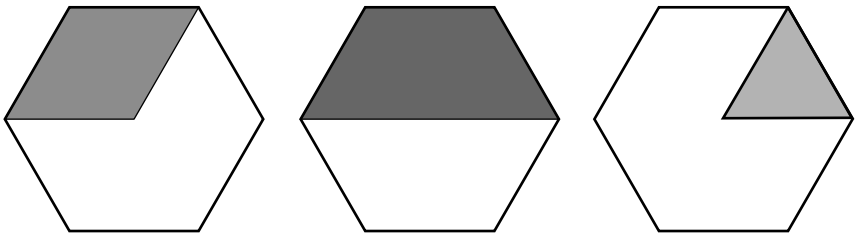
4. Show the fraction on the fraction mat.

a) four fifths **b)** two thirds **c)** four fourths



5. What fraction of the hexagon is each shape?

a) blue rhombus **b)** red trapezoid **c)** green triangle



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A Fractions as Parts of a Whole

Guided Activity

Materials	• pencil crayons • (optional) pattern blocks • (optional) paper circles

Assessment for Feedback	What You Will See Students Doing…	
Students will	**When Students Understand**	**If Students Misunderstand**
• represent fractions that are parts of a whole using concrete materials and drawings	• Students will model common fractions as parts of a whole using concrete materials and drawings.	• Some students may subdivide the whole into different-sized parts. This may be from poor planning or lack of eye-hand coordination. Provide copies of **Fraction Mats p. 59** so that the focus is on determining the number of sections to colour.

1. Introduction (Whole Class) ▸ 5–10 min

Distribute a paper circle to each student. Ask students to fold their circles and then open the fold. Have them describe the result using fraction words. Have them fold twice more to create fourths and eighths.

2. Teaching and Learning (Whole Class/Pairs) ▸ 15–20 min

Ask students to turn to Lesson 12A. Together examine the picture of the pizza and read the central question. Work through Jack's Pizza as a class, relating the sketch of the pizza to the illustration above.

Students can work through prompts A to E in pairs.

Discuss the results as a class, and make sure students understand how their responses to prompts C and D are related. (There are zero tenths left because all the slices were eaten; if all the slices were eaten, then ten tenths, or one whole, was eaten.)

Reflecting Use these questions to ensure that students can relate parts of a fraction to concrete and pictorial models.

Sample Discourse

1. a) • *The second word tells the number of parts in the whole.*

b) • *The first word tells how many parts you have.*

3. Consolidation ▸ 20–30 min

Checking (Pairs)

2. Encourage students to colour the fraction circle provided.

Practising (Individual)

4. For each shape, ask if the fraction can be divided or shaded in any other way to represent the same fraction. Use Assessment Tools 7 and 8, Masters Booklet, pp. 8 and 9, to assess answers for this key assessment question.

5. Students can use visualization or model with pattern blocks.

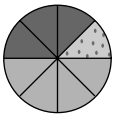
Closing (Whole Class) Ask students to write three or four sentences with fractions that show the concept of parts of a whole. For example, "I ate half of my sandwich, " or "I ate one eighth of the pie."

Answers

A. three tenths **B.** one tenth

C. zero tenths **D.** ten tenths

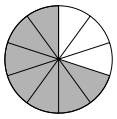
E. For example,



Four eighths of my pizza has ham, three eighths has pineapple, and one eighth has olives.

1. See sample answers under Reflecting.

2. a)



b) 10 slices

c) Three tenths of the pizza is not covered with pineapple.

3. a) one half

b) three fifths

c) three fourths

4. a)

four fifths

b)

two thirds

c)

four fourths

5. a) one third

b) one half

c) one sixth

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CHAPTER 12

B Fractions as Parts of a Group

You will need

- counters

Goal **Use fractions to describe parts of a group.**

? How can you describe parts of a group?

Brady's Fractions

In this group, 2 out of 5 students have long hair.

I can say two fifths of the students have long hair.

I'll use counters to model the students.

A. How do the counters model that two fifths of the students have long hair? Explain your answer.

B. How else can you complete this sentence?
Two fifths of the students _____.

C. Represent some or all of the students using 3 different fractions. Use counters. Write the fraction for each model.

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Reflecting

1. How is a fraction of a group like a fraction of a whole? How is it different?
2. What fraction of the students in the group are children? What fraction are adults?
3. When fractions are used to represent parts of a group, do all the parts have to look the same?

Checking

4. What fraction of each group are children? Explain.

a)

b)

Practising

5. **a)** Model three fourths using counters and a sketch.
   b) What fraction is not shaded in the sketch?

6. A kennel has 8 animals. Three eighths of the animals are cats.
   a) Model the animals with counters and a sketch.
   b) How many animals are not cats?
   c) What fraction of the animals are not cats?

7. Three fifths of a group are girls and three fifths have black hair.
   a) Represent the group using counters.
   b) How many children could be in the group?
   c) How many are girls? How many are boys?
   d) How many girls could have black hair?

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B Fractions as Parts of a Group

Guided Activity

Materials	• counters

Assessment for Feedback	What You Will See Students Doing…	
Students will	**When Students Understand**	**If Students Misunderstand**
• represent common fractions as part of a set	• Students will use a part of a set model (concrete and pictorial) to represent common fractions.	• Students who have difficulty modelling fractions using a set model should begin with two-coloured counters. They can set out the number of counters given by the second word of the fraction (e.g., 3 counters for two thirds). Then they can use the colours to show the number of parts (e.g., 2).

1. Introduction (Whole Class) ▸ 5–10 min

Select four students. Ask the class to think about attributes such as hair colour, types of shoes, and so on, and describe something about one fourth of the group. Have students develop fractions based on other attributes.

2. Teaching and Learning (Whole Class/Pairs) ▸ 15–20 min

Ask students to look at the photo of students in Lesson 12B and describe the students. Together read Brady's Fractions, and ask students if they agree with Brady's response, giving reasons. Ask students to explain what the shaded and white counters represent (long hair/not long hair). Make a list of other attributes that might be used to group the children.

Distribute counters, and have students work in pairs to complete prompts A to C. Have the pairs share their answers, encouraging them to find fractions that are different from those modelled by other pairs.

Reflecting Use these questions to ensure that students can describe parts of a group in various ways.

Sample Discourse

1. • *The parts of the group make up one whole. The difference is that you divide up a whole by cutting it up, but you divide up the group by separating the parts.*

2. • *All five are children. None are adults. So five fifths are children and zero fifths are adults.*

3. • *No, the parts don't have to be exactly the same. We used a fraction to say that two fifths of the students have long hair. These two students are different from each other, but they're both part of the group that has long hair.*

3. Consolidation ▸ 20–30 min

Checking (Pairs)

4. Students can model this question with counters.

Practising (Individual)

5. & 6. Both questions ask about the fraction that is *not* something. Ensure that students read the questions carefully.

6. Use Assessment Tools 7 and 8, Masters Booklet, pp. 8 and 9, to assess answers for this key assessment question.

7. There are a number of possible answers to Question 7, depending on how students understand the question. All that is known for sure is that three of the five are girls and three of the five have black hair. There may or may not be overlap of those attributes.

Closing (Whole Class) Ask student to draw a group of people with various characteristics. Have them write three different fractions to represent the people in the group.

Answers

A. For example, two of the five counters are shaded, so that shows that two fifths of the students have long hair.

B. For example, two fifths of the students are boys.

C. For example, one fifth are wearing headbands; five fifths are children; three fifths are girls.

1.–3. See sample answers under Reflecting.

4. a) For example, there are 2 children and 4 people in total, so two fourths are children.

b) For example, there are 6 children and 10 people in total, so six tenths are children.

5. a) For example, 

b) one fourth

6. a) For example, 

b) Five animals are not cats.

c) five eighths

7.a) For example, the three girls are represented by red counters and the other two are represented by white counters.

b) For example, there could be five children; or three children and two adults; or four children and one adult.

c) For example, three are girls. There could be zero boys and two adults, one boy and one adult, or two boys and zero adults.

d) For example, three girls could have black hair; or two girls; or one girl.

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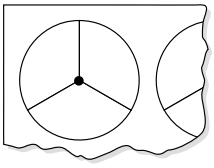
CHAPTER 13

A Fairness in Games

You will need

- spinners

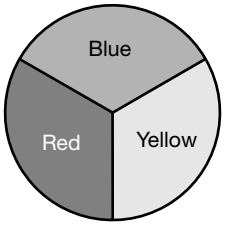


- a paper clip

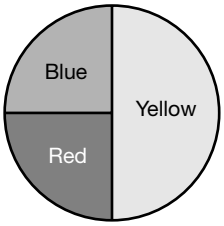
- pencil crayons

Goal **Use probability to determine the fairness of games.**

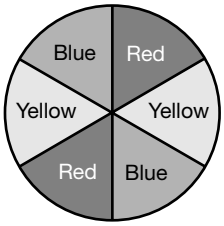
Rose, Lyn, and Juan made spinners for a game.
In the game each player chooses 1 colour.
Players score 1 point when the spinner stops on their colour.



Rose's spinner



Lyn's spinner



Juan's spinner

? Which spinners make a fair game?

Rose's Spinner		
Red	Blue	Yellow

A. Make Rose's spinner. Spin it 15 times. Tally the number of times each colour is spun.

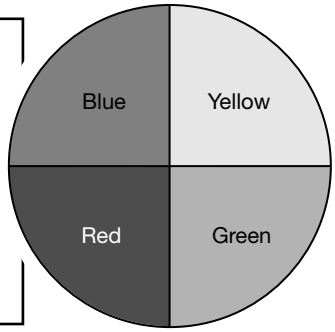
B. Repeat Part A for Lyn's and Juan's spinners.

C. Which spinner or spinners seem fair for the game? Explain.

Reflecting

1. Why do you think you got the results you did for each spinner?

2. Is it possible to use this spinner and have a game that isn't fair?



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A Fairness in Games

Exploration

Materials	• paper clips • pencil crayons
Masters	• Spinners 1 and 2, Masters Booklet pp. 46–47

Assessment for Feedback	What You Will See Students Doing…	
Students will	**When Students Understand**	**If Students Misunderstand**
• use experimental results to determine the fairness of a game	• Students will relate experimental results of spinners to the designs of the spinners to determine the fairness of a game.	• Students may not interpret the experimental results or the spinner designs to draw conclusions about the fairness of a game. Encourage them to find out which spinners gave the same results for all colours.

1. Introduction (Whole Class) ▸ 5–10 min

Discuss with students what makes a game fair. For example, ask them if a fair game of one-on-one basketball can be played if one player is 120 cm tall and the other player is 200 cm tall. Ask students to brainstorm ideas about how to make the game fair between these two players.

2. Teaching and Learning (Whole Class/Pairs) ▸ 15–20 min

Ask students to turn to Lesson 13A. Together read about Rose's, Lyn's, and Juan's spinners and examine the spinners shown in the illustration. Read the central question, then have students answer it by completing prompts A to C in pairs. Encourage them to examine the spinners and their results and talk about equally likely outcomes.

Reflecting Use these questions to make sure students understand the relationship between probability and a fair game.

Sample Discourse

1. • *Rose's spinner is in three equal parts, one for each colour, so you would have an equal chance of spinning each colour. Rashad's spinner is like Rose's except each colour has two equal parts. Rachel's spinner does not have equal parts. You will spin yellow more often because the yellow part is much bigger than the blue or red parts.*

2. • *Yes, if you use different rules. You could get a different number of points for landing on each colour.*

3. Consolidation ▸ 20–30 min

Closing (Whole Class) Show students two spinners, one with several colours of equal sections and one with several colours of unequal sections. Ask them which spinner they would choose to play a spinning game with and to explain their choice.

Use Assessment Tool 6, Masters Booklet, p. 7, to assess answers for this whole exploration.

Answers

A. For example,

Rose's Spinner		
Red	Blue	Yellow
////	𝍸 /	𝍸

B. For example,

Lyn's Spinner		
Red	Blue	Yellow
////	///	𝍸 ///

Juan's Spinner		
Red	Blue	Yellow
𝍸	𝍸	𝍸

C. Rose's and Juan's spinners; for example, everyone seems to have about an equal chance of spinning their colour with these two spinners.

1.–2. See sample answers under Reflecting.

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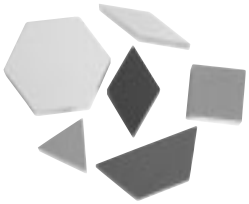
CHAPTER 14

1 Sliding Shapes

You will need

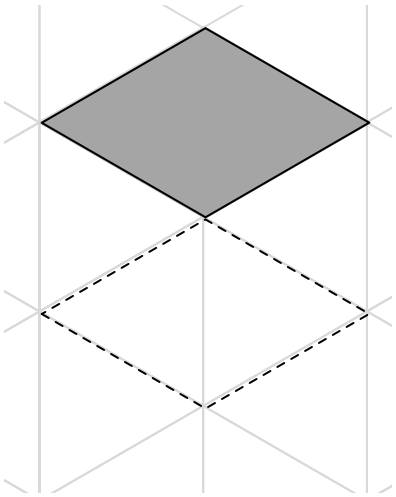
- pattern blocks



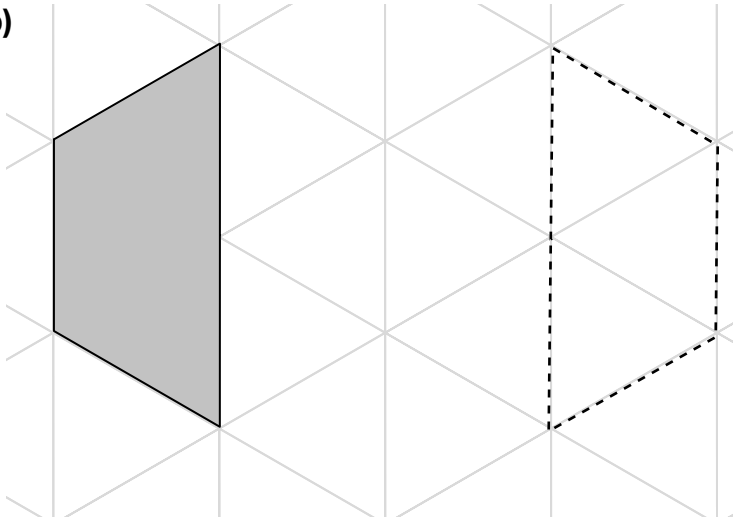
Checking

4. Can you slide the pattern block shape to cover all of the outlined shape? Explain.

a)



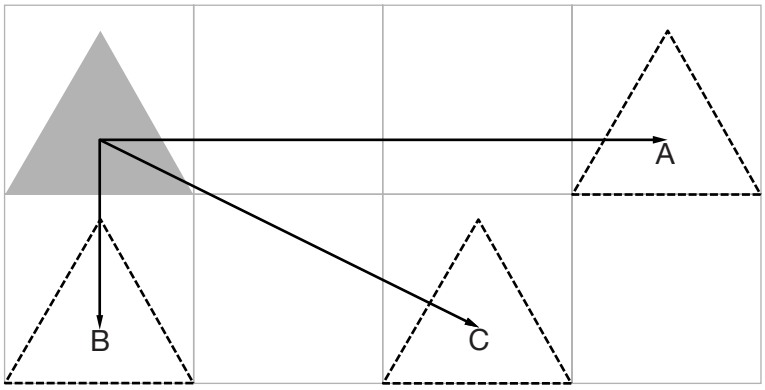
b)



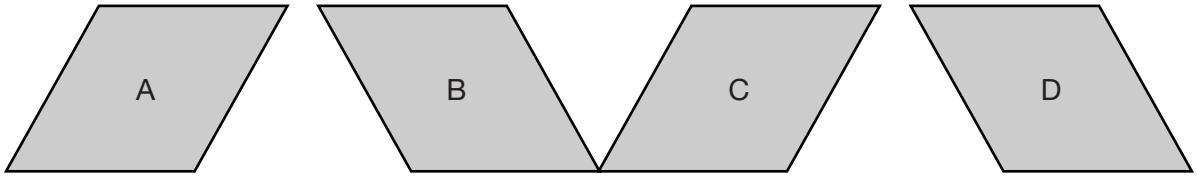
Practising

5. Describe each **translation**.

translation
A slide of a shape along a straight line



6. Which shapes can you slide to cover another shape?



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1 Sliding Shapes

Guided Activity

Materials	• pattern blocks
Masters	• (manipulatives substitute) Pattern Blocks, Masters Booklet pp. 40, 42, 44, 45

3.

Consolidation ▸ 25–30 min

Practising (Individual)

4.– 6. Provide pattern blocks for students to use to model the questions.

5. Make sure students read and understand the highlighted definition of translation before they complete this question.

Use Assessment Tools 7 and 9, Masters Booklet, pp. 8 and 10, to assess answers for this key assessment question.

Answers

4. a) Yes; for example, because the shape has just been moved straight down. The shapes are the same size and shape.

b) No; for example, the outlined shape is facing in another direction, and you can't cover all of it just by sliding the pattern block shape over top of it.

5. A: The triangle is translated 3 squares right;
B: The triangle is translated 1 square down;
C: The triangle is translated two squares right and 1 square down.

6. A can slide to C, or C can slide to A;
B can slide to D, or D can slide to B.

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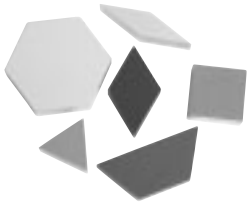
CHAPTER 14

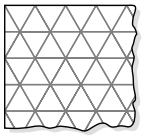
A Reflections

You will need

- pattern blocks



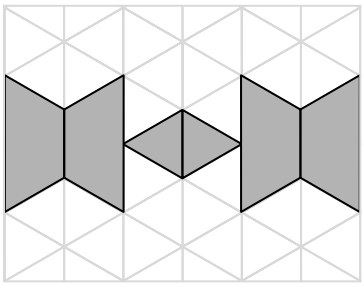
- pattern block grid paper



- a transparent mirror

Goal **Identify and describe flips.**

Devon made a shape pattern using reflections. He used the lines on a grid as lines of **reflection**.



? How can you reflect shapes?

A. Use blocks to make Devon's pattern block grid paper. Trace the blocks.

B. Which shapes in Devon's pattern are congruent?

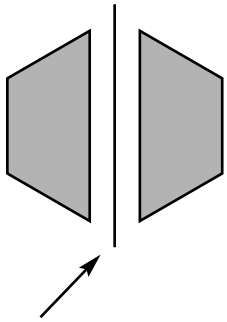
C. Which shapes in Devon's pattern are reflections of another shape? Use a transparent mirror to check.

D. Create your own shape pattern using reflections. Trace around the blocks to record your pattern.

Reflecting

1. How do you know that your pattern is made of reflections?
2. What is the same about a shape and its reflection? What is different?
3. How are reflections and translations the same? How are they different?

reflection
A flip of a 2-D shape. The shape flips to the opposite side of a line of reflection, but stays the same distance from the line.



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A Reflections

Exploration

Materials	• transparent mirrors • pattern blocks
Masters	• Pattern Blocks: Triangle (pattern block paper), Masters Booklet, p. 40 • (manipulatives substitute) Pattern Blocks, Masters Booklet pp. 40, 42, 44, 45

Assessment for Feedback	What You Will See Students Doing…	
Students will	**When Students Understand**	**If Students Misunderstand**
• identify reflections	• Students will use concrete materials to create shape patterns consisting of reflected shapes.	• Students may have difficulty creating patterns with reflected shapes. Have students begin by using only one type of pattern block, and have them check with a transparent mirror that the shapes are reflected, before they move on to using several types of blocks in one pattern.

1. Introduction (Whole Class) ▸ 5–10 min

Review with students how they know a shape has been flipped. Review also how a flip is like a symmetrical design. Explain that symmetrical designs are often used in patterns. Have students look around the classroom and on their clothing for examples of patterns that use flipped shapes.

2. Teaching and Learning (Whole Class/Individual) ▸ 25–30 min

Have students turn to Lesson 14A. Together read the highlighted definition for *reflection*. Review with students how to use a transparent mirror to check whether a shape is a reflection of another shape and discuss how reflections can be used to identify congruent shapes.

Read about Devon's shape pattern and the central question, and then have students complete prompts A to D. Provide copies of pattern block grid paper (Pattern Blocks: Triangle), Masters Booklet p. 40.

Reflecting Use these questions to check that the patterns students created in prompt D consist of reflected shapes.

Sample Discourse

1. • *I used a transparent mirror to check that the shapes are reflected.*
- *For each shape, I chose a line of reflection and flipped the shape over the line, leaving the same amount of space on each side of the line. Sometimes I didn't leave any space.*

2. • *A shape and its reflection are congruent, but the reflection is flipped.*
- *A shape and its reflection are the same shape and size, but the reflection is upside down, or reversed like a reflection in a mirror.*

3. • *In reflections and translations, the size and shape of the shape doesn't change. The positions of the shapes do change.*

3. Consolidation ▸ 15–20 min

Closing (Whole Class) Show students a pattern consisting of reflected and translated shapes, and ask students to identify the reflected shapes and the translated shapes.

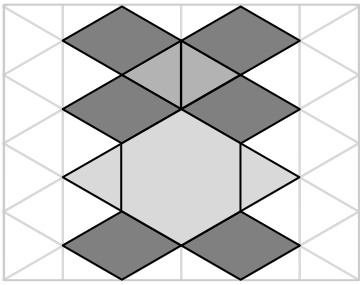
Use Assessment Tool 6, Masters Booklet, p. 7, to assess answers for this whole exploration.

Answers

A. & B. The four trapezoids are congruent and the two triangles are congruent.

C. One trapezoid in each pair is a reflection, and one triangle is a reflection of the other.

D. For example,



1.–3. See sample answers under Reflecting.

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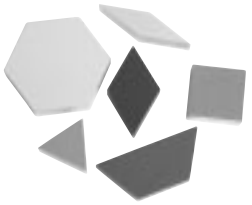
CHAPTER 14

3 Turning Shapes

You will need

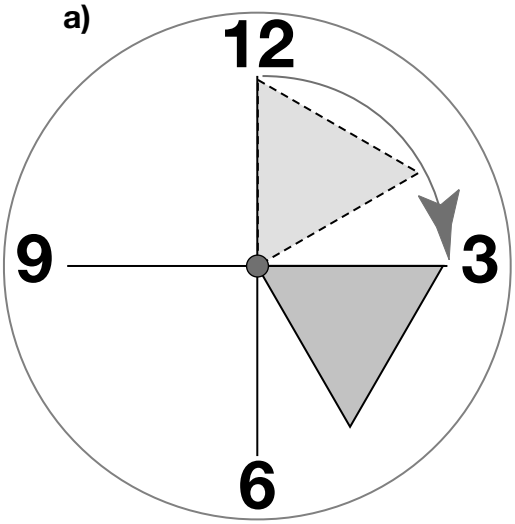
- pattern blocks



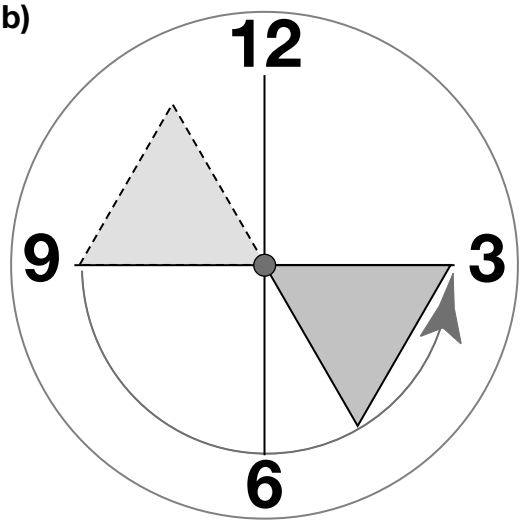
Checking

3. Model each rotation (turn) using pattern blocks. Describe each rotation by the amount (one quarter, one half, or three quarters) and the direction (CW or CCW).

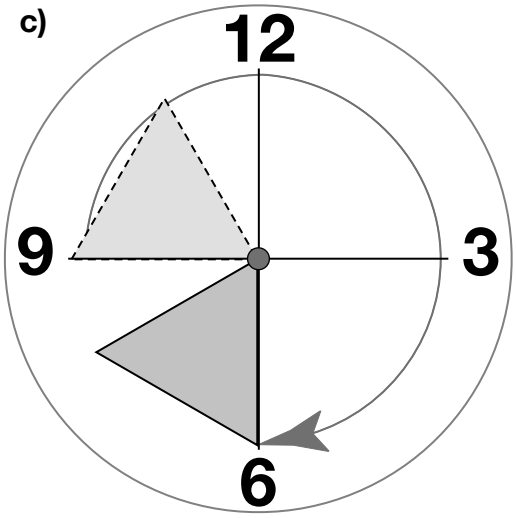
a)



b)



c)



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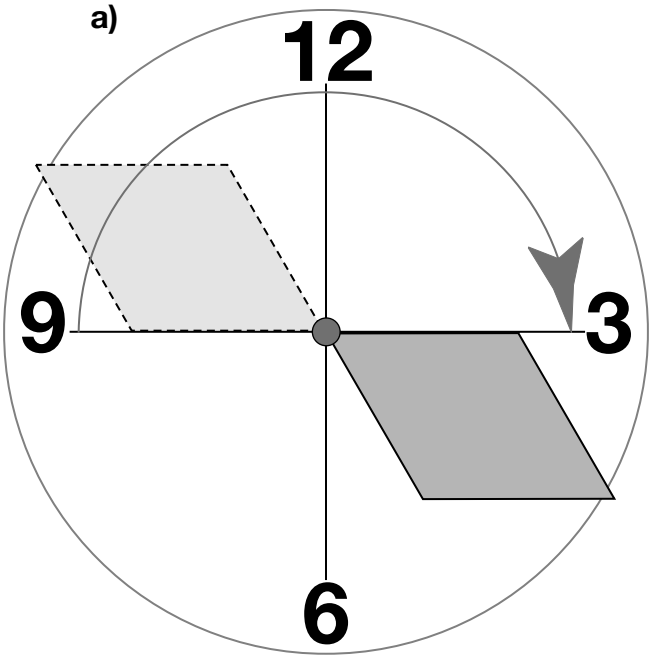
Practising

4. Model each rotation using pattern blocks. Then describe the rotation.

a)



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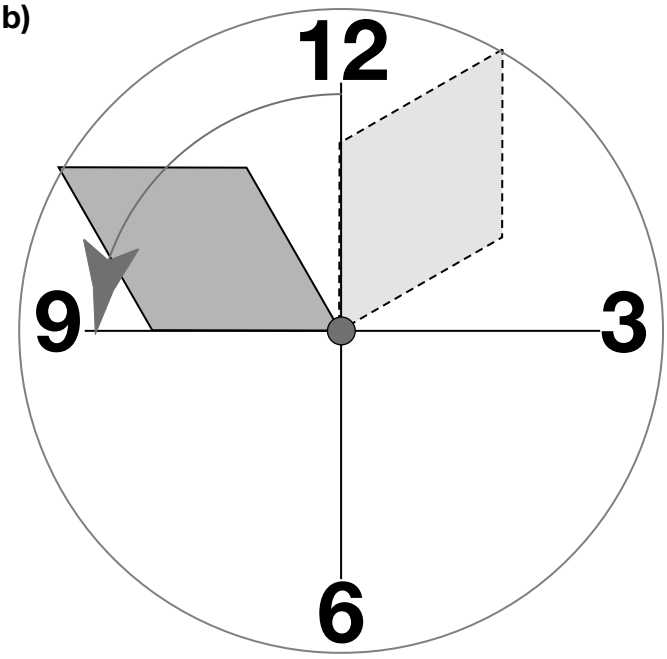

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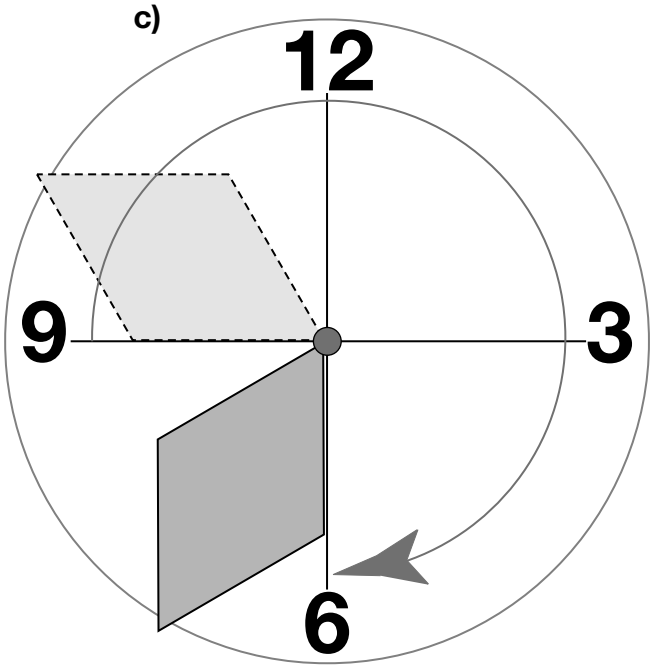

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